CEREAL SCIENCE *today*

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AN OFFICIAL PUBLICATION
OF THE
AMERICAN ASSOCIATION
OF CEREAL CHEMISTS

OF INTEREST THIS MONTH

ACTIVE DRY YEAST
MEASURING STARCH PROPERTIES
OFFICIAL AACC COMMITTEES

The Roche Review
Of Enrichment Requirements

for Cereal Grain Foods in the United States

All figures represent milligrams per pound

PRODUCT	Thiamine (B_1) Min.	Thiamine (B_1) Max.	Riboflavin (B_2) Min.	Riboflavin (B_2) Max.	Niacin Min.	Niacin Max.	Iron Min.	Iron Max.
Enriched BREAD or other *baked* products	1.1	1.8	0.7	1.6	10.0	15.0	8.0	12.5
Enriched FLOUR[1]	2.0	2.5	1.2	1.5	16.0	20.0	13.0	16.5
Enriched FARINA	2.0	2.5	1.2	1.5	16.0	20.0	13.0	*
Enriched MACARONI & NOODLE Products[2]	4.0	5.0	1.7	2.2	27.0	34.0	13.0	16.5
Enriched CORN MEALS	2.0	3.0	1.2	1.8	16.0	24.0	13.0	26.0
Enriched CORN GRITS[3]	2.0	3.0	1.2	1.8	16.0	24.0	13.0	26.0
Enriched Milled WHITE RICE[4]	2.0	4.0	1.2**	2.4**	16.0	32.0	13.0	26.0

* No maximum level established.

** The requirement for vitamin B_2 is optional pending further study and public hearings because of certain technical difficulties encountered in the application of this vitamin.

1 In enriched self-rising flour, calcium is also required between limits of 500-1500 mg. per pound.

2 Levels allow for 30-50% losses in kitchen procedure.

3 Levels must not fall below 85% of minimum figures after a specific test described in the Federal Standards of Identity.

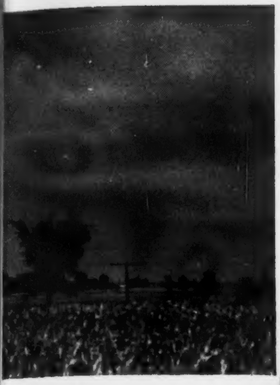
4 The Standards state that the rice, after a rinsing test, must contain at least 85% of the minimum vitamin levels. The Governments of Puerto Rico and the Philippines also require this rinsing test. If the method of enrichment does not permit this rinsing requirement to be met, consumer size packages must bear the statement, "Do not rinse before or drain after cooking." Rice enriched by the Roche method will meet the rinsing test. The South Carolina law does not require a rinsing test on packages less than 50 pounds, as the rice in small packages is presumed to be sufficiently clean.

The maximum and minimum levels shown above for enriched bread, enriched flour, enriched farina, enriched macaroni, spaghetti and noodle products, enriched corn meal and corn grits and enriched rice are in ccordance with Federal Standards of Identity or State laws. Act No. 183 the Government of Puerto Rico requires the use of enriched flour all products made wholly or in part of flour, including crackers, etc.

Brief, authoritative stories about the enrichment of many cereal grains have been gathered into a booklet which you may have for the asking. Just send your request for "The Vital Story of Cereal Grain Products" to the Department of Education, Vitamin Division, Hoffmann-La Roche Inc., Nutley 10, New Jersey.

Roche®

VITAMINS FOR ENRICHMENT COME RIGHT FROM ROCHE



VOLUME 4 • NUMBER 7 • SEPTEMBER 1959

CEREAL SCIENCE *today*

COVER: "Worm's eye" view of Minnesota corn.
Photographed by Wesley E. Madsen, St. Paul.

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Editorial

Members of the Northwest Section have a unique educational opportunity this fall. Elsewhere in this issue of Cereal Science Today there is a news item announcing that Drs. Geddes and Glass at the University of Minnesota are offering "Chemistry of Wheat and Wheat Products" for the first time as an evening course through the University's Extension Division. This is the same cereal chemistry course taken by many U. of M. students in previous years. It is the first time it has been offered at an hour that would make it easy for employed chemists to enroll. The prerequisites and the subject matter will be the same as for graduate students in the past.

This is an experiment, the outcome of which we shall watch with much interest. Over fifty chemists from the milling industry in the Twin City area have already signified their intention to register for the Minnesota course. If these individuals find the course is of real benefit to them, this could point the way for the AACC to develop an important new area of service to its members. Assistance could be given to those wishing to establish educational programs in their own areas, and courses might be offered to meet the needs of those with different levels of previous training and to cover a range of specialized interests.

To you, Dr. Geddes and Dr. Glass, and to your evening students we offer our best wishes for the success of this new venture.

P. E. Ramstad

PRODUCTION AND BAKING TECHNIQUES FOR

Active Dry Yeast

by J. A. THORN and G. REED, Red Star Yeast and Products Co., Milwaukee, Wisconsin

PRODUCTION OF ACTIVE dry yeast (ADY) is based on successful commercial drying of living organisms, in such a way that the dried cells retain their viability and metabolic activity. Not only does the process require correct drying procedures, but the wet yeast must be in the proper physiological state so that its cells can withstand drastic treatment.

Compressed yeast requires refrigeration from the time of production to final use in the bakery or the home. With ADY, this expensive system can be avoided, and deliveries can be less frequent. Shipping costs are lower, both because refrigeration is eliminated and because weight of the product at equivalent activity is reduced by almost 60%. In addition, ADY can be handled more easily within the bakeshop, although it does require rehydration prior to use.

These commercial incentives stimulated research in the development of active dry yeast and have led to improvements in activity and stability of the final product over the past 30 years.

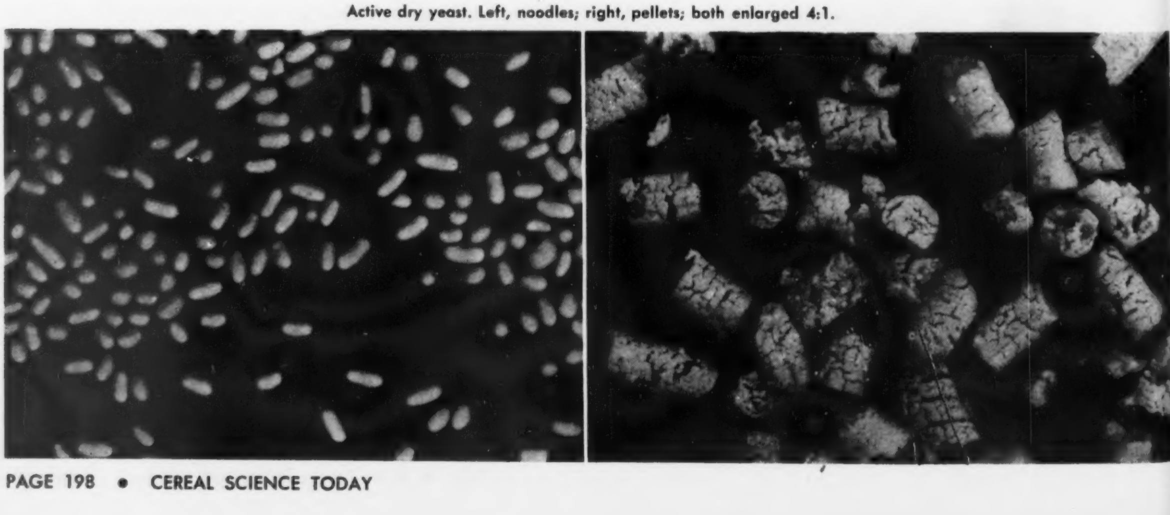
ADY appeared on the domestic market in the late 1930's when it was offered to the householder for home baking. For some years prior to this, a dried product, Yeast Foam, had been available; this was made by mixing a heavy suspension of yeast with corn meal and drying the mixture in air. A large demand for ADY was precipitated by the outbreak of the second world war, when it was apparent that compressed yeast could not be conveniently used by the armed forces in the field. At that time considerable effort was made to improve quality and increase production of ADY. From some 3 million lb. in 1940, production rose to over 13 million lb. in 1945, practically all going to the armed forces. At the conclusion of hostilities, production dropped to about 4 million lb. (in 1946) and the yeast again entered the domestic market in sizable quantities. Since that time, with increasing use by commercial bakeries and the advent of packaged bread and roll mixes, production has climbed rapidly.

Production of ADY

The production of ADY parallels that of compressed yeast to the point of pressing of the yeast cream to a plastic press-cake. For earlier stages of production of compressed yeast — propagation on molasses medium, washing and centrifuging to form a cream, and pressing of the cream — the reader is referred to standard texts.

To produce ADY, the cream is pressed to a moisture content of about 68–70%. The press-cake is then extruded through a perforated plate to form cylindrical threads of approximately 3-mm. diameter. These threads (or noodles, as they are called in the trade) are broken into sections varying from about 0.3 to 4 cm. in length, and are packed onto a continuous stainless-steel, open-mesh belt. They are then dried by a flow of warm air through the bed; drying conditions must be mild, to preserve the activity of the yeast. Air temperatures vary between 75° and 110°F., and the humidity of the incoming air is regulated to permit the yeast to equilibrate at a final moisture content of about 8%. Drying time varies between 3 and 6 hours, depending on the original

Active dry yeast. Left, noodles; right, pellets; both enlarged 4:1.



moisture content of the yeast and on temperature, humidity, and flow rates of the drying air stream. The final product consists of small, tan-colored, somewhat irregular cylinders about 2 mm. in diameter. In the photograph (enlarged 4 times), the crevices in the product and its porous nature can be clearly seen.

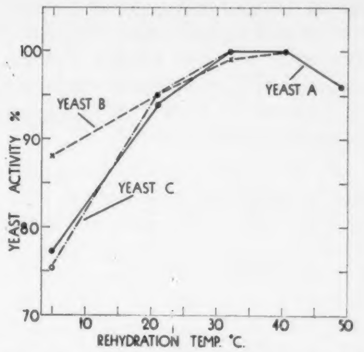
For use in the baking trade, these noodles can be used as they are and may be packed in drums or cartons of any size. Where exceptional stability is required, for instance for export or for distribution through retail channels, the yeast may be packed in small metal containers under vacuum, or in larger ones under nitrogen. For this method of packaging, residual oxygen content of the container should not exceed 2%.

Most of the ADY which is sold through retailers for use in homes, or which is used in packaged hot roll mixes, is ground and packed in small pouches under nitrogen. Any type of grinder can be used, provided the final product is not too fine. Activity of the ADY is not affected as long as the ground particles do not pass a No. 60-mesh sieve; as a rule, particles that do pass this size of sieve are not more than 2% of the weight of the product. The flat pouches are square or rectangular. A common size for the consumer trade is about 7.3 by 8.2 cm. and contains 7 g. of ADY. The material of the pouch consists generally of three layers; an inner one of pliofilm, a center one of aluminum foil, and an outer one of sulfite paper or cellulose acetate film. The ground yeast is packed under an atmosphere of nitrogen, and the pouches are heat-sealed for impermeability to moisture and air.

An alternate method of drying yeast, not practised widely at the present time, consists of drying, again with warm air, on the inside of rotating drums. Abrasion of the particles and shaping through the motion of the drums result in the formation of pellets, shown in the photograph (right; four times actual size). These pellets have excellent stability but require a somewhat longer time for rehydration.

Quality Control and Methods of Evaluation

The most important criteria for ADY are its moisture and nitrogen contents. Stability of the yeast is inversely related to both of these properties, whereas the baking activity of fresh ADY is more or less directly related to them. The nitrogen and moisture contents of ADY are, therefore, chosen to provide the best baking activity consonant with reasonable activity. These values are: for nitrogen, about 6.5–7.0%, and for moisture, about 8%. Table I shows the composition of two brands of ADY as found in the field.



Effect of rehydration temperature on activity of ADY in straight doughs. (Data for yeast A obtained from reference 3.)

Table I. Nitrogen and Moisture Contents of ADY (22 samples)

Brand	*Nitrogen*		*Moisture*	
	Av. %	*Range* %	*Av.* %	*Range* %
A	7.04	6.69–7.29	7.94	7.39–8.52
B	6.53	6.20–7.06	7.86	7.52–8.20

The color of ADY is kept as uniform as possible. While the color of yeast has no bearing on its activity or on the crumb color of bread, uniformity is necessary because consumers tend to distrust changes in the physical appearance of the yeast.

As in the case of compressed yeast, ADY is inspected for bacteriological purity. Since the yeast is a dry product, mold growth is not encountered in the field. *Bacillus mesentericus*, the causative agent of rope, is the bacterium of most concern to the baker and he carefully guards against it.

Yeast Activity

The activity of ADY is best determined by actual bake tests. Either straight or sponge doughs may be employed, and the formula may be lean, median, or rich. If fermentation times are held constant, loaf volume is a direct function of the yeast's activity. On the other hand, if dough or loaf volumes are held constant by means of variable fermentation times, yeast activity is inversely proportional to the over-all fermentation time. With either method, one or more control doughs made with yeast of known activity should be run to eliminate day-to-day variations in operator and bakeshop conditions. The activity of the unknown yeast can then be related to that of the control or standard yeast. ADY, packed under vacuum or nitrogen and stored under refrigeration, retains its activity quantitatively for a year or more and serves admirably as a standard.

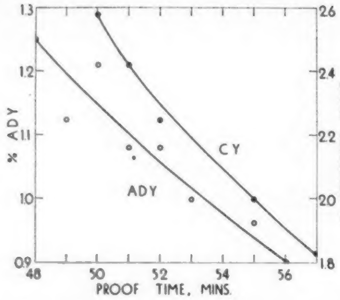
For best correlation with actual usage, the dough system and formula chosen for testing activity should be similar to those in which the yeast is ultimately to be used.

In the laboratory, yeast activity can be estimated from the rate of gas production in synthetic media as determined in the fermentometer (1,5). This procedure can be scaled down to allow use of Warburg microrespirometer equipment. The results from these procedures do not correlate as well with the performance of yeast samples in doughs, however, as do data obtained by measuring gas production in doughs with Sandstedt-Blish pressuremeters (4). We have found this method to correlate extremely well with bake activity in straight doughs when the same yeast, salt, and sugar concentrations are used in both systems. It is not precise enough to allow accurate estimation of sponge dough proof times, however, probably because of the difficulty of reproducibly mixing the small sponge doughs involved.

ADY in the Bakery: Rehydration

ADY requires rehydration in the bakery prior to use. The amount of water required is not critical, but at least 4 lb. of water should be used for each lb. of dry yeast to obtain a slurry which is not too thick. The temperature of the rehydration water is critical: between 40° and 45°C. for optimal results. A graph above shows the effect of rehydration temperature on yeast activity. Below 35°C., activity diminishes rapidly because of the high amount of solids which are leached out of the yeast. Above 45°C., the yeast begins to be inactivated by heat.

Rehydration may be carried out in any suitable container such as pails



Effect of yeast concentration on proof time of sponge doughs. Sponges were fermented 4 hours; doughs contained 2% salt and 4% sucrose.

and small mixing tanks. In larger bakeries, "yeast emulsifiers" are convenient for dispersion of compressed yeast before it is added to the mixer. Special semiautomatic rehydrators are available which will rehydrate up to 10 lb. of ADY with water delivered at the proper temperature. Rehydration may be done in the presence of other minor ingredients which are commonly added to bread sponges, such as yeast food, enrichment wafers, and fungal enzymes. Time is not critical, since ADY, after 2 to 3 minutes of contact with water of the proper temperature, may be chilled without harm. Therefore, a rehydration cycle, including addition of water, ADY, and other ingredients and including mixing and emptying from the rehydrator to the sponge mixer, will require about 10 minutes.

Conversion Ratios

Because compressed yeast is a perishable commodity which cannot be kept for several months at the same activity, it cannot be used as a standard for the evaluation of ADY. Furthermore, the relative activities of ADY and compressed yeast vary with variations of dough ingredients, so that definite conversion ratios cannot be assigned. Nevertheless, some general guides can be provided.

Conversion ratio can be defined as the amount of ADY which will give equivalent bake results to compressed yeast, expressed as the percentage of compressed yeast. For instance, if 2.5% of compressed yeast can be replaced with 1.25% of ADY the conversion ratio is 50%; if it can be replaced with 1% of ADY the conversion ratio is 40%. The lower the conversion ratio, the more favorable is the activity of ADY in comparison with compressed yeast. Generally speaking, ADY will have a conversion ratio of 45–50% for sponge doughs having a salt concentration of 2% and a sugar concentration up to 8% (see graph). For example, 2.25% compressed yeast may be replaced by 1.05% ADY, for a conversion ratio of 47%.

As the sugar (or salt) concentration is increased, however, the conversion ratio will become lower. Thus, for semisweet doughs such as bun doughs the ratio will be 40–45%, and for sweet doughs with sugar levels of 15–20% the conversion ratio will be between 30 and 40%. The marked effect of sugar concentration on gas production by compressed and active dry yeasts is shown in Table II. The doughs, containing flour 10, salt 0.2, water 8.0, ADY 0.068 or CY 0.20 g., and different amounts of sucrose, were fermented in Sandstedt-Blish pressuremeters until the control doughs (4% sucrose) had formed 250 mm. mercury pressure.

Table II. Inhibition of CY and ADY at Different Sugar Levels

Sucrose in Dough	*CO_2 Produced*		*Inhibition*	
	CY	*ADY*	*CY*	*ADY*
%	*mm Hg*	*mm Hg*	*%*	*%*
4.0	250	250	..	..
10.0	230	240	8	4
15.0	191	218	24	13
20.0	151	188	40	25
25.0	110	165	56	34

The lesser osmosensitivity of ADY is apparent from this table. The advantage in rate of fermentation expected through use of ADY in sweet doughs has been fully corroborated by bake tests.

Oxidation Requirements

During rehydration of ADY small amounts of cell constituents are leached out of the yeast cell and remain in the liquid portion (2). One of these constituents is glutathione, a tripeptide which has a reducing effect. Like other reducing compounds, glutathione makes doughs more extensible and may induce slackness. Therefore, doughs made with ADY require somewhat higher oxidation than doughs made with compressed yeast. For instance, for a sponge dough made with compressed yeast the optimum concentration of potassium bromate was found to be 10 p.p.m. The same dough made with ADY required 20–30 p.p.m. of potassium bromate for optimum results.

The higher oxidation requirement can readily be supplied with bromate containing yeast foods, preferably of the double-strength variety which contains 0.6% of potassium bromate.

Reduction in Mixing Time

Even at sufficiently high levels of oxidation, ADY will permit a reduction in mixing time. This is generally of the order of 25%. For this reason it is advisable to discontinue the use of fungal protease when converting from compressed yeast, at least until mixing requirements for ADY dough have been determined.

The decrease in mixing requirements is advantageous, resulting in savings in power consumption and in allowing more leeway in scheduling the movement of doughs in the bakery.

Effect of ADY on Absorption

ADY which has been properly rehydrated will not affect absorption in the proper sense of that term. However, it is customary to use 2 extra lb. of water for each lb. of dry yeast in a sponge or dough. This represents the water removed from the yeast in drying, and it should be added back as part of the formula. While this additional water cannot be claimed as "absorption," it will, of course, increase dough yields and affect the economy of using ADY.

Storage and Stability of ADY

The stability of ADY is adversely affected by moisture pickup from the atmosphere and by high temperatures. Therefore, it is advisable to store the yeast in a dry, relatively cool room. A survey of ADY in trade channels indicates a loss of approximately 7% of its activity over a period of 1 month and at temperatures prevailing in bakeshops where it is used. This makes it advisable to use ADY within 4 weeks after arrival.

Under conditions which require additional stability, such as the export of ADY to tropical countries or for storage periods of several months, the yeast can be effectively protected by packing under vacuum or under nitrogen.

ADY in the Home

For home use, ADY is available either in 7-g. nitrogen-packed envelopes or in 4-oz. vacuum-packed tins. Because its stability allows it to

(Please turn to page 213)

MEASURING THE USEFUL PROPERTIES OF STARCH[1]

A. L. ELDER and T. J. SCHOCH, George M. Moffett Research Laboratories, Corn Products Company, Argo, Illinois

THE UTILITY OF starch in both food and industrial applications was developed originally as an art. When Brillat-Savarin in his *Physiology of Taste* remarked that "starch is a perfect food, especially when it is least mixed with foreign material," he was most certainly speaking as a gourmet, not as a nutritionist. A second stage of development was supplied by practical technology, primarily of an engineering or an applicational character. By such means, the manufacture of starch has progressed from a tedious batch process employing settling tanks and tray-drying to a continuous operation with centrifugal separators and flash dryers. In the majority of instances it has been the starch user who has developed novel applications, rather than the starch supplier. For example, when diesels replaced donkey engines in the oil fields, the well driller could no longer use steam-cooked starch pastes to body-up his drilling muds. And so he called upon the starch manufacturer to supply a pregelatinized product which would form a paste with cold water.

The last two decades have brought a third stage of development, that of intensive fundamental research. No longer is the starch manufacturer merely the supplier of a commodity. In addition, he must have the best possible understanding of the physical and chemical nature of his products, the basic reasons why different starches behave as they do in each field of use, and how to alter this behavior at will to fit the desired need. Some 5 years ago a research group was set up at these laboratories to define and explore those physical properties of starch systems which are important over a wide range of uses. This program will be described after a very brief review of six aspects of starch chemistry which are pertinent to the discussion.

Pertinent Aspects of Starch Chemistry

Starch Granules. Starch is composed of minute cells or granules, so small that it takes three-quarters of a trillion to make 1 lb. of corn starch. As depicted in Fig. 1, the size and shape of these granules are peculiar to each botanical variety of starch.

Gelatinization. The granules are insoluble in cold water. But when heated in water above the so-called gelatinization temperature, they undergo a progressive swelling, as shown by photomicrographs in Fig. 2. Even after prolonged cooking, the swollen granules persist as intact though fragile entities.

[1] Presented at the 44th annual meeting, Washington, D.C., May, 1959. Also presented before the Institute of Chemistry, Manchester, England, May 1, 1959.

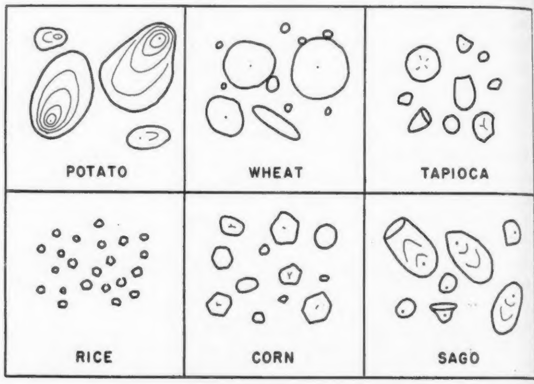


Fig. 1. Microscopic appearance of various starches.

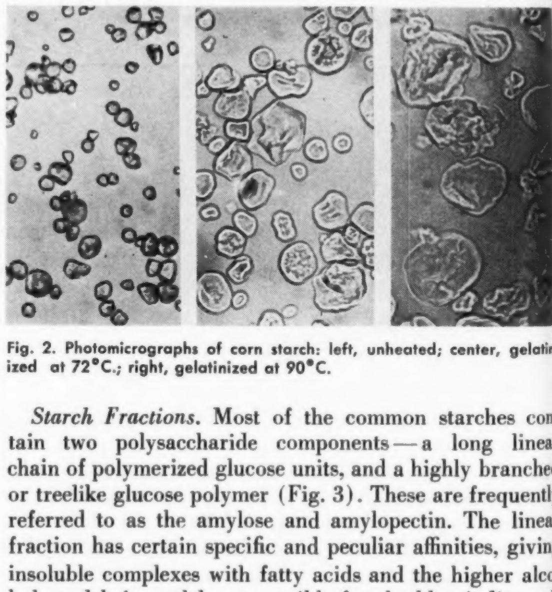


Fig. 2. Photomicrographs of corn starch: left, unheated; center, gelatinized at 72°C.; right, gelatinized at 90°C.

Starch Fractions. Most of the common starches contain two polysaccharide components — a long linear chain of polymerized glucose units, and a highly branched or treelike glucose polymer (Fig. 3). These are frequently referred to as the amylose and amylopectin. The linear fraction has certain specific and peculiar affinities, giving insoluble complexes with fatty acids and the higher alcohols and being solely responsible for the blue iodine coloration of starch.

Retrogradation. The linear fraction is likewise primarily responsible for the phenomenon of retrogradation, reflected in the spontaneous insolubilization and setback of starch pastes. As schematically represented in Fig. 4, these effects are due to side-by-side association of linear starch chains through hydrogen bonding, to give either a precipitate or a gel network.

Waxy Starches. Certain genetic varieties of the cereal starches are of the so-called "waxy" type, naturally devoid of a linear fraction. Hence these starches are finding

increasing use where retrogradation effects must be avoided. For nonfood uses it is also feasible to modify the common nonwaxy starches by oxidation or etherification, which warps or kinks the linear fraction so that it resists retrogradation, thus giving more stable and noncongealing products.

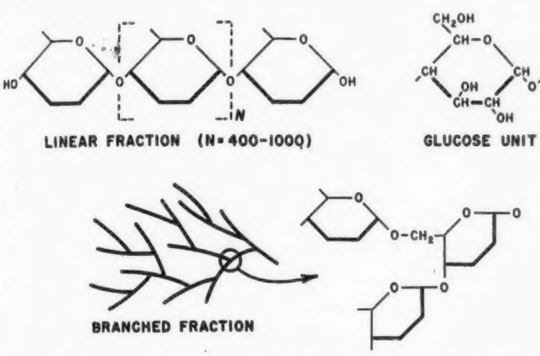


Fig. 3. Structures of the linear and branched starch fractions.

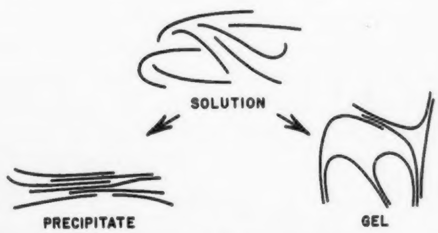


Fig. 4. Mechanisms of retrogradation.

Granule Structure. The two fractions appear to be laid down in the starch granule in radial fashion to form a spherocrystal (Fig. 5). Wherever the linear molecules or linear segments of the branched molecules run parallel, they "zipper" together into bundles or micelles. This micellar association is responsible for holding the starch granule together. Even when the starch is cooked in hot water, the micelles still persist to give a swollen network of associated molecules.

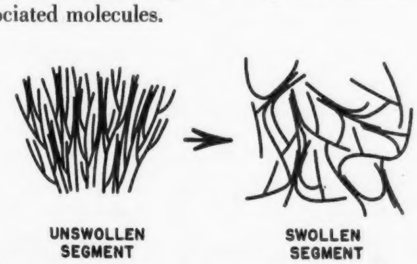


Fig. 5. Swelling of a segment of the starch granule. Thickened sections indicate micellar areas.

Properties of Starch Systems

We are interested in the properties of three different starch systems: 1) behavior of the granules, 2) pastes or solutions, and 3) dried-down films or coatings. Some of the properties of the starch granule which are important to the user are:

1. State of aggregation. Are the granules separate, or are they aggregated into clumps, depending on the mode of drying? This can be readily determined microscopically. Some users, such as the offset printer, want an impalpable powder which can be sprayed as a dusting agent; others, like the brewer, require a completely dust-free product.

2. Ionic charge. This is primarily important to the industrial user of starch derivatives, which may contain either positive or negative groups. For example, a positive-charged cationic starch will adsorb more completely on negative-charged cellulose when used as a beater additive in a paper mill. The charge on the starch granule is readily determined by its ability to stain with positive or negative dyes.

3. Gelatinization temperature. The Kofler microscope hot stage provides a very simple means for determining the point at which the granules start to swell when heated in water.

4. Rate and extent of granule swelling.

5. Rate and extent of granule solubilization.

Detailed methods for evaluation of the first three properties have been published (8). The last two items describe the way in which the starch granules swell and dissolve when heated in water suspension to progressively higher temperatures. These latter studies were reported at the 1958 AACC meeting in Cincinnati (3). To recapitulate briefly, each starch has its own peculiar pattern of swelling. This can be determined by suspending a weighed starch sample in stirred water, heating in a thermostatted bath for 30 minutes, then centrifuging, decanting the aqueous supernate, and weighing the precipitate of swollen granules. The weight of this precipitated paste per g. of dry starch is termed the swelling power. If the swelling power is determined at intervals of 5°C. over the pasting range of the starch, the curves shown in Fig. 6 are obtained. Potato starch swells very rapidly, tapioca starch somewhat more slowly. Corn and sorghum starches show a restricted two-stage swelling, indicative of two sets of bonding forces within the granule, which are broken at

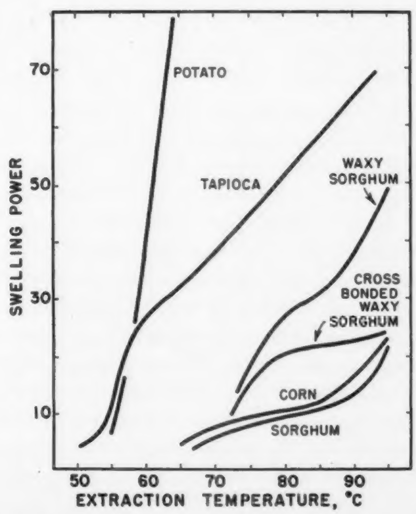


Fig. 6. Swelling patterns of various thick-boiling starches.

different energy levels. Waxy sorghum starch (also known as white milo) swells more freely than its regular sorghum counterpart, since it contains no linear fraction to reinforce the molecular network within the granule. But if this waxy sorghum starch is chemically cross-bonded with phosphate groups, the granules become highly resistant toward swelling.

The percentage of soluble starch which leaches out of the granule during swelling can also be determined, by drying an aliquot of the supernatant solution from centrifuging. The resulting solubilization curves (Fig. 7) are very similar to the swelling curves. Potato and tapioca starches show the highest solubilization, the cross-bonded waxy sorghum, the least. These same techniques can be used to elucidate the swelling and solubility characteristics of the various modified starches, or the influence of added substances on starch swelling (3).

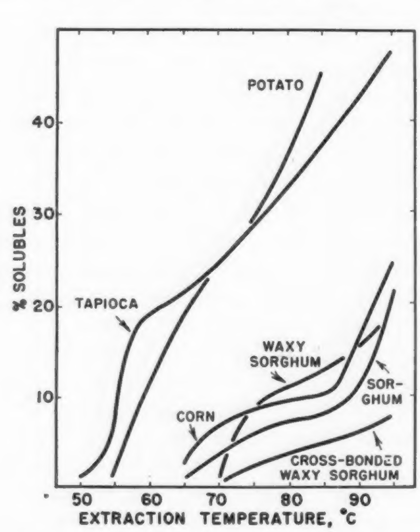


Fig. 7. Solubility patterns of various thick-boiling starches.

Of what practical use is this information? We can now understand why potato and tapioca starches cook so readily, to give a high but unstable viscosity. Obviously, the greatly swollen granules must be very fragile, breaking down under mechanical shear or prolonged cooking. In contrast, corn and sorghum starches cook more slowly and swell to a lesser degree. Hence they give somewhat lower but more stable viscosities, without the development of high solubles. This is one of the reasons why corn starch has become the "work horse" of the starch industry in the United States. In special cases where the highest possible stability is desired, starches chemically cross-bonded with phosphate or epichlorohydrin are finding increasing use. Such products undergo only limited swelling and solubilization, and hence are ideally suited as thickening agents for canned foods, since they retain their viscosity during pressure-sterilizing.

Paste Properties

Once the starch granule is swollen, we have a paste. Some properties of a paste which are obviously important to the user are:

1. Viscosity during cooking and cooling.
2. Viscoelastic effect. Potato starch and the waxy starches give stringy cohesive pastes, while those of corn and wheat starches are "short" and heavy-bodied. This behavior reflects the ease of deformation and elasticity of the swollen starch granule. Methods for evaluating this property are being worked out.
3. Breakdown of viscosity under shear.
4. Stability toward cold storage.
5. Gel tendencies. While frequently desirable in a food product, the inclination to skin or gel is usually considered an unmitigated nuisance by textile and paper manufacturers.
6. Molecular dispersion. It is of considerable importance whether the starch substance is dissolved as single discrete molecules or associated into micellar bundles. We have no method for determining particle size distribution in starch and dextrin solutions.
7. Paste clarity or transparency.
8. Wetting and protective colloid action. This covers diverse surface-active qualities, ranging from the difficult problem of sizing some of the newer textile fibers to the development of a better starch for emulsifying salad dressings. Certain of these items will be considered in detail.

Viscosity

Viscosity is certainly primary in importance, and many ways of measuring this property have been used. For research purposes the Brabender recording viscometer is used, by which the starch is cooked to 95°C., held at this temperature for 1 hour, then cooled to 50°C. and held for an hour (5). Each species of starch gives its own peculiar type of curve (Fig. 8). The high swelling and solubilization of potato and tapioca starches are reflected in their high pasting peaks and substantial breakdown on cooking. In contrast, corn and regular sorghum starches show greater granule stability and little breakdown on cooking. The cross-bonded waxy sorghum starch is particularly interesting, since it shows no pasting peak. Indeed, the granules do not break down at all dur-

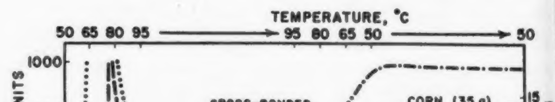


Fig. 8. Brabender viscosity curves of various thick-boiling starches. Concentration given in g. of starch (dry basis) per 500 ml. of slurry.

ing cooking, but instead undergo an additional slow swelling; this explains the slight rise in viscosity during the 95°C. cooking period.

Another phase of starch viscosity is of considerable practical importance — the change in viscosity under shear or high-speed agitation (2,6). When the user must hold a cooked starch paste under agitation for several hours or must pump the paste around his factory, he is necessarily concerned with the thinning which may result from fragmentation of swollen granules. A simple test of this action involves shearing 5% starch pastes for 20 minutes at various stirring speeds, and determining the change in Brookfield viscosity. Typical breakdown patterns are shown in Fig. 9. The weakest starch paste is waxy sorghum, which breaks down rapidly even at low shear rates. But if a few phosphate cross-bonds are introduced into this same waxy sorghum starch, it gives pastes of maximum stability toward shear. The relative positions of the curves for corn, potato, and tapioca starches indicate the fragility of their swollen granules.

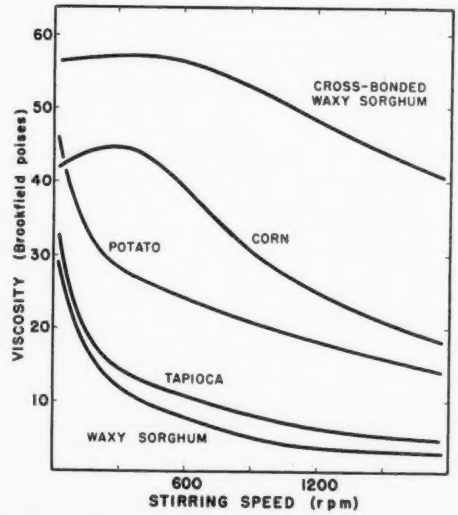


Fig. 9. Effect of rate of shear on the viscosity of 5% pastes of various thick-boiling starches (after 20 minutes' stirring).

Cold Storage Stability

Modern methods of food preservation include deep-freezing and prolonged cold-storage. Where pasted starch is employed as a thickening agent in the food, the accelerated retrogradation at low temperature may cause undesirable physical changes, including gel formation, development of opacity, and syneresis or seepage of water from the paste. This latter effect is particularly objectionable in pie fillings and frozen foods. For test purposes, the development of syneresis can be greatly exaggerated by successively freezing and thawing the starch paste, then centrifuging and determining the amount of separated water (2). Several such freeze-thaw cycles are equivalent to months of cold-storage at 40°F. Figure 10 shows some typical results. Corn starch is generally unsuitable for this purpose, since the paste breaks down excessively after one freeze-thaw cycle. Waxy sorghum is excellent, showing

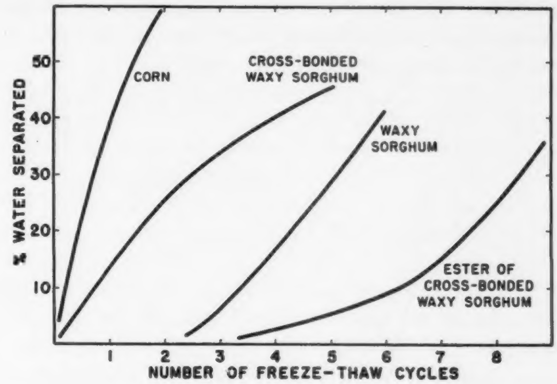


Fig. 10. Progressive syneresis of water from 5% pastes of various starches, subjected to repeated freeze-thaw treatments.

marked separation of water only after four or five cycles. However, the unmodified waxy starches are too stringy and cohesive for most food applications. Cross-bonding the waxy starch with phosphate or epichlorohydrin stabilizes the swollen granule so that it loses its long stringy cohesiveness. But this treatment likewise decreases its freeze-thaw stability. However, a judicious combination of cross-bonding and esterification not only gives the desired paste consistency, but also imparts marked improvement in stability.

Paste Clarity

Still another quality of a starch paste of interest to the user is transparency. In the food industry, this is frequently important on esthetic grounds. For example, the starch used for thickening fruit pie fillings should give a fairly transparent paste to avoid a dull muddy appearance. In contrast, opacity may be a desirable characteristic of the starch used in a salad dressing or an instant dessert, imparting a light, bright color. Apart from such considerations of eye-appeal, paste clarity is related to the state of dispersion and the retrogradation tendency of the starch, and hence it will influence other technologically important qualities of the starch. An opaque and retrograded dextrin solution makes a poor remoistening gum for labels and postage stamps.

Paste clarity is influenced by many factors — concentration of the starch, pH, the presence of salts or other adjuncts, cooking and aging procedures, etc.[2] The effect of starch concentration, as illustrated in Fig. 11, is a case in point. Unmodified corn starch is prone to retrograde, hence it is the most opaque. Chemical derivatization progressively increases the paste clarity, as shown by the curves for hydroxyethyl starches of 0.04 and 0.1 degree of substitution (i.e., containing four and ten hydroxyethyl groups per 100 glucose units, respectively). In these two instances, the introduction of a few hydroxyethyl groups prevents the linear starch molecules from aligning themselves into an associated or retrograded pattern. Unmodified waxy sorghum starch is by far the most transparent of these four products, because it contains

[2] Maywald, E. C. (unpublished work).

no linear fraction. Note the peculiar reversal of the curves, clearer at 3% than at 1–2%; this is very real and can be readily discerned with the eye.

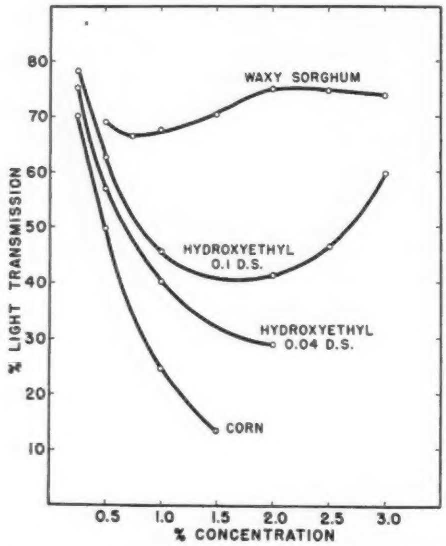


Fig. 11. Paste transparency of various thick-boiling starches as influenced by starch concentration (water = 100%).

The action of various surfactants on the clarity of a 1% corn starch paste provides some interesting results (Fig. 12). Polyoxyethylene monostearate markedly increased the opacity, probably by forming an insoluble complex with the linear fraction. The nonpolar "Pluronics F-68" (polyoxyethylene polyoxypropylene, Wyandotte Chemical Co.) had no effect whatsoever. For some obscure reason, the anionic "Duponol ME" (sodium lauryl sulfate, Du Pont) and the cationic "Arquad 18" (dimethyl octadecyl ammonium chloride, Armour) greatly increased the transparency. However, too much importance should not be attributed to interaction between the surfactant and the linear fraction, since much the same pattern is obtained with a waxy sorghum starch of high purity.

Starch is frequently used as an emulsifying agent, for example in salad dressings. In a method recently devised

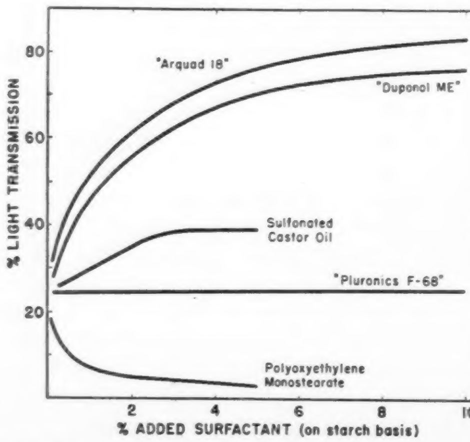


Fig. 12. Effect of various surfactants on the transparency of 1% corn starch pastes.

at these laboratories, the stability of such oil-in-water emulsions is evaluated by the rate of coalescence of the dispersed oil droplets on prolonged storage (4). A red dye is first dissolved in the oil, which is then dispersed in the starch paste by pressure-homogenization. The finer the size of the dispersed oil droplets, the lighter is the color of the emulsion. It has been found experimentally that the logarithm of percentage light reflected by the emulsion gives a straight line when plotted against log of average droplet size. Hence the red emulsion is illuminated under blue light (450 mμ) in a reflectance spectrophotometer, and the percentage reflectance calculated into terms of droplet size. As shown in Fig. 13, thin-boiling corn starch is a rather poor emulsifying agent for paraffin oil, allowing rapid coalescence of oil droplets to a limiting diameter of 35 microns, at which point the system stabilizes. An oxidized starch provides somewhat better stability, but it cannot compare with such products as a cationic corn starch containing substituent quaternary groups, or an anionic corn starch sulfate. The stability in these two instances is attributed to the high ionic charge on the starch colloid.

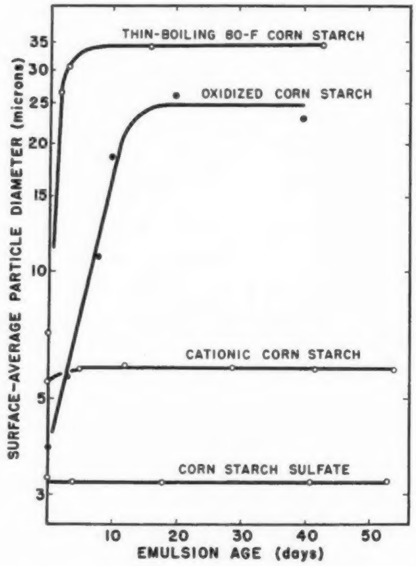


Fig. 13. Storage stability of oil-in-water emulsions in 1% pastes of various modified starches.

Dried Starch Films

Most of the industrial applications of starch products involve the formation of a dried film or coating of some sort — for example, the sizing of textiles and paper, and the use of starch and dextrin as adhesives for everything from postage stamps to sand cores for foundry casting. There are also the commercial pregelatinized starches which reconstitute to a paste when stirred into cold water. Such products may be regarded merely as starch pastes dried to a film on heated rolls or in a spray-dryer.

One of the most important properties of a starch film is the associative bonding between starch molecules within

the film, which affects such properties as solubility, response to humidity, plasticity, etc. In general, rapidly dried films are somewhat more water-soluble than slowly dried films, simply because the molecules have not had sufficient time to associate. As a homely example, if starch-sized laundry is slowly dried on a clothes line, the starch becomes insoluble and does not spot when sprinkled with water prior to ironing. But if dried in a heated dryer, the sizing remains soluble and hence prone to water-spot. Incidentally, this insolubilization by slow associative bonding is likewise responsible for the staling of bread (7).

We have devised a simple test for evaluating both the *extent* and the *strength* of associative bonding within a starch film (1). The starch paste or dextrin solution is cast as a film on stainless-steel plates, then dried under carefully controlled conditions of humidity and temperature. This gives a free film which is analogous to the sizing on a sheet of paper. This film is extracted with water at various temperatures, and the amount of starch substance which dissolves is determined. Figure 14 illustrates the solubility behavior of films from three very different starches. A film of unmodified waxy sorghum

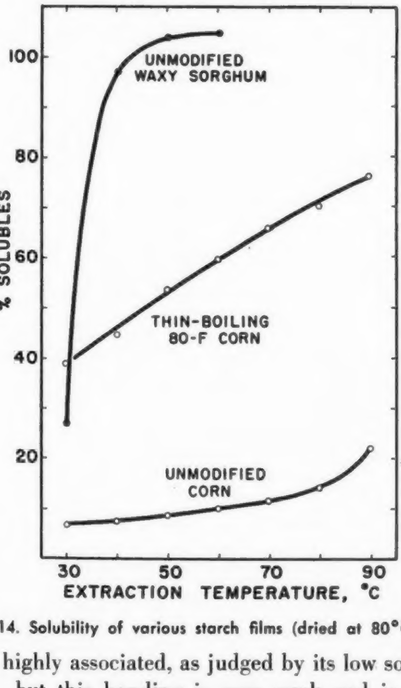


Fig. 14. Solubility of various starch films (dried at 80°C.).

starch is highly associated, as judged by its low solubility at 30°C., but this bonding is very weak and is broken merely by extraction at 40°–50°C. In contrast, a film from unmodified corn starch is not only *highly* associated but likewise *strongly* associated, with relatively little increase in solubility when extracted at 90°C. Film from a thin-boiling corn starch is in an intermediate position, with moderate extent and strength of association.

The type of starch modification has a major influence on film properties. Figure 15 shows the solubility patterns of five different thin-boiling starches, all of which have approximately the same low viscosity. Ordinary acid-modified corn starch is least soluble, owing primarily to retrogradation of the linear fraction. Introduction of hydroxyethyl groups into this product progressively increases its film solubility, as shown by the curves for thin-boiling starch ethers of 0.04 and 0.1 degree of substitution. Even these few hydroxyethyl groups distributed along a linear molecule interfere with its association. Similarly, a hypochlorite-oxidized corn starch shows only a slight degree of weak association, because the linear chains have been kinked by the introduction of carbonyl groups. As the ultimate, an acid-modified waxy sorghum starch gives films which are completely dissociated and water-soluble.

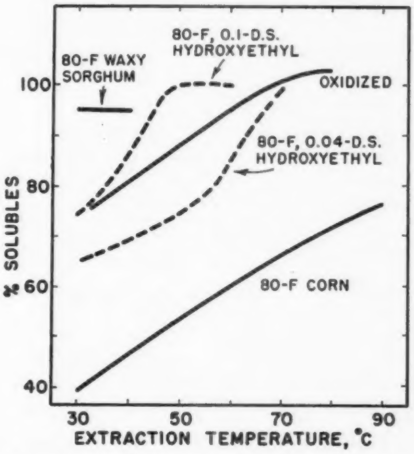


Fig. 15. Solubility of films of various thin-boiling starches. Films dried at 80°C.

Several instances might be cited to show how film association is related to practical use. Recently, a customer experimentally tested waxy sorghum starch for bonding mineral wool in acoustic ceiling tile. The dried tile showed good tensile strength at low humidities, but sagged and warped when subjected to high humidity. This behavior reflects the higher plasticity of the weakly associated branched molecules. Much better resistance to humidity was realized by the use of regular corn starch, with its stronger and more rigid molecular association. Moreover, if the wet tiles containing pasted corn starch were allowed to age for 6 to 8 hours before kiln-drying, resistance to humidity was further increased. Obviously, this allowed retrogradation to occur within the starch paste, with consequent higher association in the dried film.

Remoistening gums used on labels and postage stamps exemplify the opposite requirement in an adhesive. Here the film should be completely soluble when wetted with water, and this is best realized with the high-soluble envelope gums and the thin-boiling waxy starches. Moreover, the film should retain its water-solubility, even when exposed to high humidity for considerable periods of time. For these reasons, the thin-boiling corn starch shown in Fig. 16 would make a poor remoistening gum, since its low initial solubility of 63% drops to 42% on

exposure for 1 week to high humidity. When envelopes are bought in large quantity, the moistened flaps will at first stick immediately and firmly; but some time later the adhesive bond may have to be supplemented with fresh adhesive. This deterioration appears to be due to associative bonding which slowly develops in the film, lowering its solubility and hence its adhesiveness.

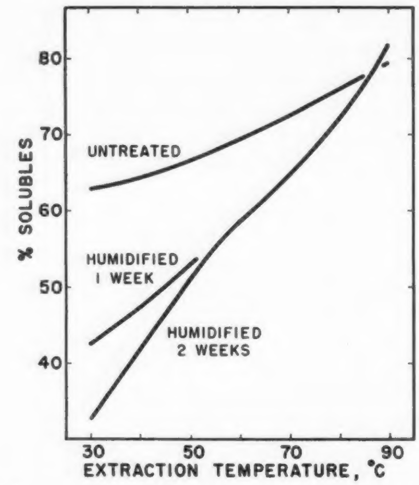


Fig. 16. Effect of 93% relative humidity on the solubility of roll-dried acid-modified corn starch (80-fluidity).

It is sometimes desirable to apply the starch in soluble form, and then insolubilize the film *in situ*. An example is the thermosetting adhesive used in fabricating water-resistant corrugated board. Here a cross-bonding agent may be added to the pasted starch, to produce copolymerization during heat-curing of the adhesive bond. This action is illustrated in Fig. 17, where 5% of urea-formaldehyde (on starch basis) was added to a cooked solution of thin-boiling corn starch, the paste immediately coated out, and the film dried at 80°C. The much lower solubility of this film is evidence of the chemical cross-bonding induced during drying. The addition of 10% of urea-formaldehyde produced a small additional insolubilization under these conditions.

Forecast

Certain representative phases of our fundamental studies have been briefly described. Eventually, we hope to discover and evaluate and understand some 15 or 20 basic starch properties which are important over a wide range of uses. It might even be feasible to classify the properties of each starch on a punch card system. Correspondingly, another set of cards might be punched for each individual use of starch. Where the starch description matched the use description, then we should have the optimum product for that particular application.

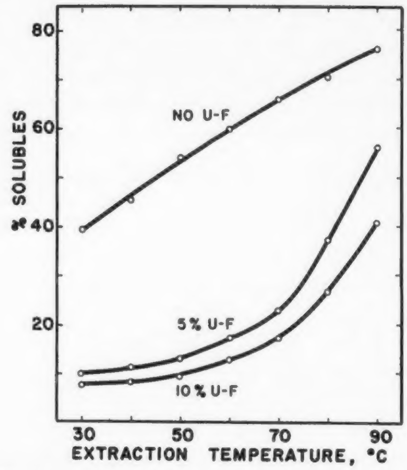


Fig. 17. Effect of urea-formaldehyde on the solubility of films from acid-modified corn starch (80-fluidity).

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People, Products, Patter

• • • People

William L. Ensor appointed manager, dairy cattle feed research, at Quaker Oats Co.'s John Stuart Research Laboratories, Barrington, Ill., and at Ful-O-Pep research farm. **R. O. Nesheim** appointed manager of livestock feed research. **H. W. Bruins** becomes manager of nutrition and biochemical research. **L. A. Wilhelm** appointed director of poultry development and market research, Ful-O-Pep feed division; formerly manager of poultry feed research.

Ensor

Wilhelm

William E. Guenther appointed assistant to operations and training manager in agricultural sales at Merck & Co., Inc., Chemical Division.

William Henderson named advertising manager of Wallace & Tierman Equipment Divisions; will handle advertising and promotion of chlorination and chemical feeding equipment, precision instruments, and processes for the food industry.

David C. Herting elected member of American Institute of Nutrition; he is senior research chemist in biochemistry department, Distillation Products Industries division of Eastman Kodak Co. The election was partly in recognition of "meritorious original investigations" he conducted in the chemistry and physiology of nutrition.

H. G. Hinck promoted to senior vp of Wallerstein Co., division of Baxter Laboratories, Inc.; will continue to act as secretary-treasurer besides additional responsibilities in new post.

Daniel E. Hooton appointed to sales staff of chemurgy division, Central Soya Co.; will handle West Coast sales of the company's products. **John Wicklund** joins Chicago sales force for special products of Central's Chemurgy Division; was manager of meal sales for Chicago and Indianapolis plants.

Roger A. Morrison named mgr. Eastern Div. for Quaker Oats Co.'s Ful-O-Pep feeds (from manager Lawrenceburg, Indiana, division), after some division consolidations and administrative changes; replaces **C. E. Gaw,** resigned. **B. P. Beckerdite** named district sales manager, Lawrenceburg district. **A. J. O'Donovan** appointed poultry and marketing specialist for Eastern Division. **B. O. Ahlstrom** now sales manager, Tampa district, and **H. T. Mills** becomes district representative in local Tampa territory.

L. R. Patton, C. I. Kennedy, and **Robert S. Whiteside** of Sterwin Chemicals toured a new plant at Aurora, Ontario, which will handle manufacturing for Sterwin, Sterling Drug Mfg. Ltd., and other Sterling affiliates. The photo shows (L to R): Patton, sales manager; Kennedy, office manager at Aurora plant; and Whiteside, president.

Perie Pitts Rumold, a prominent member of the American Association of Cereal Chemists and past National Treasurer (1940 to 1944), died Friday, June 19, in Kansas City, Missouri. Mr. Rumold returned from Beirut, Lebanon, for medical consultation a short time before his death. In Lebanon, he was director of quality control for the United Nations Relief and Works Agency for Palestine refugees.

Mr. Rumold was born in Dillon, Kansas, obtained his education in the state and was graduated with a B.S. degree from the Department of Milling Industry, Kansas State University. Immediately after graduation, he became associated with the milling business and was employed for 22 years by the Standard Milling Company of Kansas City, serving much of this time as chief chemist. It was during these years that Mr. Rumold served the AACC in many ways.

In the period 1944–1948, Mr. Rumold acted as advisor on cereal techology and grain storage to the Iranian government and was in charge of operations of the large flour mill in Teheran. After he returned from this assignment, he owned and operated a bakery in Columbia, Missouri, from 1948 to 1953. He then joined the United Nations with headquarters in Beirut, Lebanon, where he remained until he became ill.

Mr. Rumold's life was one of dedicated service, not only to his work, his family, and friends, but also to his associated duties. He enjoyed his connections with the AACC and was devoted to the interests he served in the Middle East.

Mr. Rumold is survived by his wife, Eleanor, and a married daughter.

Thomas J. Schoch, supervisor of basic starch chemistry at the Corn Products Co.'s George M. Moffett Research Laboratories, Argo, Ill., has been awarded the Saare Medal for his pioneering research work in starch and starch fractions. The award was made during the 1959 Starch Congress held recently in Detmold, Germany. The first paper delivered at this Congress was Dr. Schoch's: "Measuring the useful properties of starch."

The Saare Medal was presented by Mr. L. Altrogge, president of

the Association of Cereal Research. (See photo, with Dr. Schoch.) In his presentation speech he said:

"Your many scientific works enjoy international recognition and admiration. Your publications are known to everyone working in the starch field."

Mr. Altrogge outlined Dr. Schoch's research to determine whether starch consisted of a single polysaccharide or several carbohydrate substances and in the latter case to develop adequate methods of fractionation; and his development of methods for selective precipitation of the linear starch fraction with butyl or amyl alcohol, which gave a new impetus to starch research throughout the world. He also touched upon Dr. Schoch's work on the Schardinger dextrins; on the influence of phosphate and fatty acid on starch; subfractionation of the linear fraction; isolation of phytoglycogen from sweet corn; degradation of starch in hot alkali; mechanism of the staling of bread; starch microscopy; and the use of starch in paper sizing.

"Very few persons work so successfully on so many scientific problems, to develop such fundamental and pioneering discoveries," President Altrogge concluded. "Thus you have devoted your life to science and the study of starch."

Following receipt of the Saare Medal, Dr. Schoch visited three European plants of the Corn Products Company and addressed various technical groups at universities and institutes in Germany, England, Scotland, Wales, The Netherlands, and Belgium.

Walter L. Van Nostrand appointed vp-production, Wallerstein Co., from plant manager at Staten Island location.

F. A. Collatz retired at the end of July after 34 years with General Mills' Products Control Department. Dr. Collatz received his degrees from the University of Minnesota, and was employed by the Diamalt Company before joining G.M.I.'s predecessor, Washburn Crosby Company, in 1925. A long-time and well-known member of the A.A.C.C., he was active in Association affairs and served on numerous committees.

At a dinner in his honor, Dr. Collatz (right, above) received from Dr. F. C. Hildebrand, General Mills Vice-President and past President of the A.A.C.C., a testimonial scroll bearing the good wishes and signatures of 60 of his associates. His future plans include travel, time to enjoy his grandchildren, and his hobbies of fishing, music, and stamp collecting.

• • • Products

Spray-dry equipment for flavorings. For increased production of their line of "Diamond-Sealed" entrapped powdered flavors, Fries & Fries, Inc., have installed a new 40-ft. stainless-steel spray dryer at their plant in Cincinnati. The dryer is one of three similar units developed for the company; all appear to have greater efficiency and economy than standard spray dryers. Capacity of the newest unit is about 300 lb. per hour. Information on Fries & Fries "Diamond-Sealed" flavors is available on request to either the Cincinnati (110 E. 70th St.) or New York (418 E. 91st St.) address.

• • •

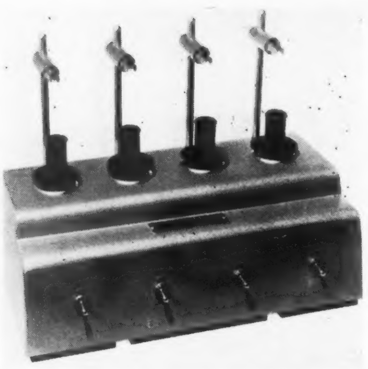
Soybean protein for the food and baking industries. An isolated soybean protein of valuable properties, produced by a process developed after many years of research, will be handled jointly by the J. R. Short Milling Co. of Chicago and General Mills' Oilseeds Division of Minneapolis, according to a recent announcement.

This protein, which is both light in color and bland in flavor, can be used in large concentrations in baked products without materially affecting the physical properties of the finished product, and thus will be of particular interest to the baking industry. At the same time, it can make a significant contribution to the nutritional value of baked foods.

Production on a limited scale is to start at once, and future plans call for a commercial plant at one of the General Mills soybean plants, the announcement said. Plants at Belmond, Iowa, and Rossford, Ohio, produce soybean flakes, the primary raw material for manufacturing this isolated protein. Soybean meal is 44% protein, but the new process, developed by the J. R. Short Milling Co., produces a 100% protein.

• • •

Test tube mixer. A new principle of mixing and stirring in test tubes without corking, capping, or inserting anything into the test tube is used in the Vortex Test Tube Mixer, to be placed on the market soon by Kraft Mfg. Co. More thorough mixing in a fraction of the usual time, the company states, results in more accurate determinations. Individual motors allow the test tube holders to operate independently, and a patented motion creates a



vortex, which results in amazingly rapid mixing. The device is recommended for chemical mixing, protein washing, etc. (See photo.) More information can be had from Kraft Mfg. Co., 68-60 140th St., Flushing 67, N. Y.

• • •

Measurement of X-ray and gamma radiation. A new Microdosimeter System is announced by Bausch & Lomb, which is capable of highly accurate radiation measurement. The system is composed of the detector, a very small cylinder or rod (1 mm. by 6 mm.) of silver-activated phosphate glass, and a new reader which is a special fluorimeter designed to measure the change in fluorescence that takes place in the rods as a result of high-energy radiation exposure. (See photo.)

The system provides accurate means for measurement of X-ray or gamma radiation in the 10-rad to 10,000-rad range. It has satisfactorily undergone extensive tests under actual use conditions by Bausch & Lomb and leading research groups over a 2-year period, according to the announcement. For more information, write to Bausch & Lomb Optical Co., Rochester 2, N. Y., specifying catalog D-299.

Protective eyewear. Another new Bausch & Lomb item is a new-model durable metal frame for safety eyewear with their Bal-SAFE lenses, having a redesigned, expansion type endpiece which allows easy assembly of both lenses and side shields. The same front can be used with or without side shields, and with no alteration of lens size. Assembly (or disassembly) of the shields is simplified and they are held in place as securely as if they were a permanent part of the frame. A choice of six types of shields is offered. Ask about M-70, Safety Products Dept., Bausch & Lomb Optical Co., Rochester 2, N. Y., requesting catalog A-1800.

• • • Patter

Nebraska Bakery Production Club, meeting on June 29 at Rancho Kaufmann, the home of Henry Kaufmann in Omaha, elected these officers for the coming year: William B. LeMar, president; Kurt Becker, pres.-elect; Walter Kros, vp; F. Robert Grant, 2nd vp; Ed Rosse, sec.-treas. Next meeting of the Club will be the annual picnic to be held in Omaha on the second Monday in September.

• • •

Danger in artificial drying of wheat, at temperatures which will injure protein quality, is pointed out by the Kansas State University extension service. They refer to studies by Karl Finney of the K-State flour and feed milling department, in which the gluten protein fraction of the grain was made useless, except for feed, when wheat was dried by an air temperature of 120° F. and a low air-flow rate. This seems to be due to stimulation of an enzyme which, at this temperature, destroys the gluten. In drying at 160°, however, the wheat protein was damaged to a lesser extent, apparently because this higher temperature destroys the protein-softening enzyme. This suggests that wheat dried at a materially higher temperature than 160° might escape injury, but caution must be exercised because of direct damage to the gluten by excessive heat.

"For the present," Finney said, "we are unable to recommend a drying temperature materially above 90°, but simply wish to point out that higher drying temperatures are critical."

Finney has found that optimum test weights were obtained 4 to 8 days before Pawnee wheat was ripe. The moisture content of the wheat 4 days before it was ripe was 28%, and 8 days before, 38%. From this it can be concluded, Finney said, that wheat harvested 8 days before ripe, or at 38% moisture, can be dried artificially to a safe storage moisture content without reducing test weight or encountering any shrinkage other than moisture loss.

• • •

"The Givaudan Flavorist" (No. 3, 1959) has a lead piece about vanillin, outlining briefly its history and sketching the main methods that have been milestones on the road to present-day production. The manufacture or derivation of vanillin from eugenol, from guaiacol, and from lignin is touched upon in a short but adequate section for each source, all combining into an adept treatment of the synthetic flavoring as contrasted to natural vanilla. Other flavor items, described briefly in this issue, are the Givaudan cheese flavors and imitation strawberry and pineapple. Inquiries for copies of the **"Flavorist"** will be welcomed by Givaudan Flavors, Inc., 321 W. 44th St., New York 36, N. Y.

• • •

Sandwich Month. August was National "Sandwich Month," coast to coast, and "Sandwitchery" was the magic word for food industry merchandising success. Leading food manufacturers and food stores went all-out for sandwich appeal, with the backing and assistance of the Wheat Flour Institute which served as coordinator for the annual all-foods, storewide promotion.

An estimated average of 95 million sandwiches a day are eaten in this quick-meal country. That figure adds up to more than 34.5 billion sandwiches consumed in 1959, with August taking the biggest bite.

The Wheat Flour Institute serves as coordinator for the campaign. Manufacturers, processors, distributors, retailers, wholesalers, and industry trade associations are the "participant-sponsors" who have carried the program into this 9th consecutive successful year. It was open season for sandwiches!

• • •

How will the space man eat? "Feeding the men who go out to space" is considered in the June 1959 leaflet, **D&O News,** issued by Dodge & Olcott, Inc., makers of essential oils, flavor bases, and related products. Man's predicted travels in space are the concern of the food industry, and the technology of this vast field will be taxed to the utmost in finding answers to the many original prob-

lems involved.

The state of weightlessness has created the need for special food and drink containers. Eating, in the manner familiar to those who are earthbound, is virtually impossible in a space craft at zero gravity. Therefore, it has been proposed that special containers be manufactured to seal in ready-to-eat foods. Those tested so far are of the squeeze-tube variety.

Another method under serious consideration includes the "bacteria-algae-plant-animal cycle." A new strain of algae increases 1,000 times a day as compared to only 8 times a day in previously employed types. The process of photosynthesis, which replenishes the oxygen cycle on earth, can be made to take place in these "captive" algae. Besides removing the carbon dioxide waste and replenishing the oxygen supply in a space vehicle, the algae can also furnish proteins and vitamins. Much work, however, must be done on improving the palatability of algae before they can be made a staple part of the diet of the man in space.

For copies of **D&O News** write to Dodge & Olcott, Inc., 180 Varick St., New York 14, N. Y.

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University evening course in Cereal Chemistry. The General Extension Division of the University of Minnesota will offer a course in "The Chemistry of Wheat and Wheat Products" beginning October 1. The lectures will be given by Drs. W. F. Geddes and R. L. Glass of the Department of Agricultural Biochemistry. The class will meet each Thursday evening for 11 weeks.

The course will deal with the structure and chemical composition of the various parts of the wheat kernel, the chemical life history of the wheat plant, and the chemistry related to harvesting, storage and processing of wheat into food products. Different milling and baking procedures will be outlined but major emphasis will be placed on the chemical and biochemical aspects of these procedures. Flour bleaching, maturing, diastating, and enrichment will be discussed. Criteria of flour strength, including rheological properties of doughs, various adjuncts used in baking, and other aspects of cereal chemistry will be considered.

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COLLABORATORS WANTED. The committee on fat acidity would like to hear from members of the Association interested in collaboration in a study of methods for determining fat acidity. This study is being undertaken in conjunction with the forthcoming revision of Cereal Laboratory Methods. Contact Robert L. Glass, Department of Agricultural Biochemistry, University of Minnesota, St. Paul 1, Minnesota.

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Technical Translations. Keeping in touch with technical developments throughout the world is made easier by "Technical Translations", a bi-monthly publication of the Office of Technical Services of the U. S. Dept. of Commerce. Annual subscription is twelve dollars. OTS prepares this list of translated literature with the co-operation of the Special Libraries Association Translation Center.

Two translations recently listed as available from Associated Technical Services, Inc., P.O. Box 271, East Orange, N. J., are:

Hanssen, E. and Florian, G. PROTEIN SHIFTS IN FLOURS THROUGH AIR CLASSIFICATION. (1958) 6 p. Trans. of Die Muhle (East Germany) 1957, v. 94, p. 539-540.

Hanssen, E. and Florian, G. PROTEIN SHIFT IN RYE FLOUR THROUGH AIR CLASSIFICATION. (1958) 3 p. Trans. from Die Muhle (East Germany) 1958, v. 95, No. 21.

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Status of lactose under Food Additives Amendment. Arthur A. Checchi, assistant to the deputy commissioner of the Food and Drug Administration, stated in a recent letter that as a common food ingredient, generally recognized as safe, lactose (milk sugar) is not subject to the clearance provisions of the Food Additives Amendment. Therefore, any questions as to why lactose was not listed among other foods in the Amendment are satisfactorily answered.

Thorn & Reed:

(Continued from page 200)

be kept for several weeks, it is a particular boon to the housewife who bakes infrequently. Proper rehydration is undoubtedly the most critical step in the use of ADY in the home; water or milk at body temperature, or slightly above, is recommended. Since nearly all home recipes call for an excess of yeast (2 to 3 times the amount used in a bakery), no difficulties should be encountered unless the rehydration procedure is grossly mismanaged.

Mix Packs

Because of their convenience, packaged mixes have assumed a major role in home baking and, to a certain extent, in institutional baking. Such mixes commonly contain all the ingredients except the liquid, which must be added by the user, and are available for bread, hot rolls, coffee cakes, and pizza pies. The ADY required for these mixes is packaged under nitrogen in pliofilm-aluminum-acetate pouches of various sizes; for example, pouches containing 5, 7, 10, 21, and 42 g. of yeast are commonly employed. The amount of yeast provided with each mix depends more on the amount than on the composition of the mix. In general, about 8 g. are supplied per lb. of hot-roll mix, 8–10 g. per lb. of pizza-dough mix, and 10 g. per lb. of bread and coffee-cake mixes. Thus, calculated on the basis of flour, the level of yeast employed is quite high, 2–3%.

The above discussion of the use of ADY in bakeries and in the home has illustrated the versatility of this type of yeast. This, together with continuing improvements in quality and the recent introduction of convenient rehydration equipment for the bakery, points to an ever-increasing demand for ADY.

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1. Atkin, L., Schultz, A. S., and Frey, C. N. *Cereal Chem. 22:* 321 (1945).
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3. Ponte, J. G., Jr., Glass, Robert L., and Geddes, W. F. *Cereal Chem.* (in press).
4. Sandstedt, R. M., and Blish, M. J. *Cereal Chem. 11:* 368 (1934).
5. Schultz, A. S., Atkin, L., and Frey, C. N. *Ind. Eng. Chem., Anal. Ed. 14:* 35 (1942).

EMPLOYMENT NOTICES

WANTED: EXPERIMENTAL BAKER for laboratory of large midwestern mill. Good salary and working conditions. Advise giving full particulars to: Dept. 42, CEREAL SCIENCE TODAY, 1955 University Avenue, St. Paul 4, Minnesota.

BOOK *reviews*

Brief Course in Organic Chemistry, by L. C. Behr, R. C. Fusen, and H. R. Snyder; 2nd ed. John Wiley & Sons, Inc., New York, 1959; 289 pp. Price, $5.75. Reviewed by IRWIN J. GOLDSTEIN, University of Minnesota, St. Paul.

The second edition of *Brief Course in Organic Chemistry* by Behr, Fusen, and Snyder has resulted in a modernization of the first version, published in 1954. There are many notable additions, e.g., discussions of substances of practical value in agricultural, medicinal, and industrial chemistry; new chapters on homologous series, naturally occurring esters, and sulfur compounds; and new illustrative photographs and drawings of molecular structures.

Basically, however, the book has not changed. As a text in organic chemistry it can be recommended, as the authors state, only for students of agriculture, home economics, nursing, etc. As a reference book it is too brief. However, for the individual who is not involved directly in the field of organic chemistry it will serve as a good refresher text.

The authors have endeavored to bring the latest ideas and concepts to the student. The early mention of conformation, the reference to molecular orbital interpretation of valence, and the liberal use of drawings of molecular models to stress spatial relationships are all commendable.

Aromatic and heterocyclic substances are introduced early in the text, and in their systematic discussion of the functional groups the authors consider these two classes of substances together with aliphatic compounds. This approach tends to remove the artificial barrier which is sometimes erected when these substances are considered separately.

Among the examples of natural products, medicinals, and agricultural chemicals are presented some of the most recent, the structures often being included.

In spite of the fact that this book was designed as a text for *short* courses in organic chemistry, it is disappointing that the mechanism of organic reactions is delayed until the very last brief chapter. Nor is brevity an excuse for an outdated discussion of the biological oxidation of fatty acids, especially in the light of rapidly expanding views on this subject.

In the chapter on carbohydrates an instance of incorrect nomenclature was encountered by the reviewer. D-gluconic acid is incorrectly referred to as D-glucosaccharic acid. Also in the chapter on carbohydrates, one cannot but comment on the unconventional ring structure of the sugars. It is felt that the use of such strange formulations is not warranted.

In spite of the above limitations, this text is a good, terse, modern statement of the principles of organic chemistry, suitable for nonprofessional students, or as a refresher for the worker who has been out of touch with the field for some years and wishes to reacquaint himself with basic concepts.

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Radiation Preservation of Food, published by U.S. Army Quartermaster Corps, Aug. 1957; 475 pp. Price $5.00. May be ordered from OTS, U.S. Dept. of Commerce, Washington 25, D.C.

This book, published to aid the food researcher entering the new field, contains all information accumulated by the Army Quartermaster Corps during its first four years of pioneer research into the use of ionizing radiation for preservation of food. Much of the information has appeared in technical journals, but some of the most important findings were drawn from unpublished Government reports, files, and technical papers.

The QMC initiated research on the process in 1953 with the double aims of perfecting it for processing military food supplies and, with cooperation from industry and other Government agencies, eventually turning it over to the commercial food processing industry.

The comprehensive volume contains chapters dealing with the social implications and history of radiation food processing. Other chapters consider the physical, chemical, biological, and technological aspects of the new process. Problems and predictions for future development and commercialization are also discussed.

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Food Industries Manual. Chemical Publishing Co., Inc., New York, 1958; 979 pp. Price, $16.00. Reviewed by J. F. WINTERMANTEL, General Mills, Inc., Minneapolis, Minnesota.

A technical and commercial compendium on the manufacture, preserving, packing, and storage of food products, this volume is the American edition, which is based on the 18th completely revised British edition.

This book is basically an encyclopedia describing terms associated with the food industry. Subjects covered include descriptions and functions of various food ingredients; formulas and descriptions of manufacture of some common foods and food processes; chemical, physical, and biological quality control tests; processing and laboratory control equipment; terms associated with food sanitation, including common pests of foods; biological descriptions of materials related to food processing; packaging materials; composition and constituents of foods; and numerous other definitions of terms which are familiar to food manufacturers. Of particular interest to cereal chemists are the chapters on "Flour and flour milling" and "Breadmaking and confectionery," both compiled by A. J. Amos. Related subjects of interest are found in the chapters on "Packaging" and

"Edible fats and fatty foods," and the tables of information under "Composition of foods" and "Vitamins in foods."

Many of the descriptions are necessarily brief, and do not contain enough detail for one desiring complete information on the subject. However, the book is a handy quick reference for the individual in need of information on the highlights of a great variety of subjects.

Since the book is basically a British publication, some of the tests, equipment, and terms which are defined are not used in this country. Also, since the food industry includes such a vast area, many less common food topics are not covered. The manual will be of interest principally to those who are in need of a readily available general source of information on common subjects associated with the food industry.

■ ■ ■ ■ ■

Scientific Russian, by G. E. Condoyannis. John Wiley & Sons, Inc., New York, 1959. Price, $3.50. Reviewed by ROBERT C. WORNICK, Agricultural Research Dept., Chas. Pfizer & Co., Inc., Terre Haute, Indiana.

In today's grim competition between East and West for scientific and technological superiority, the side having the best knowledge of the other's accomplishments possesses a significant advantage. At present this advantage lies with the Communists because of their extensive government-sponsored program of translation and discrimination of foreign publications, as well as to their widespread espionage activities. Although several excellent translation services have been operative in the West in recent years, the coverage of technical literature from Russia and her satellites is still incomplete and not well coordinated or disseminated.

Keeping abreast of Soviet publications in his field is the obligation of every responsible Western scientist. Professor Condoyannis' book will serve as an excellent tool for accomplishing this task. It is designed primarily for the beginner who desires only a reading knowledge of Russian technical articles and books. However, because of its differences in approach, it will serve as a useful refresher and reference for those who have already taken formal courses in college Russian.

The usual lengthy vocabulary of terms used in the text is conspicuously absent from its traditional place after the final chapter. From the start, the use of a good scientific Russian-English dictionary will be essential. However, this is a minor inconvenience. A list of suggested up-to-date dictionaries in various fields of science would have been a very desirable addition to the Preface.

The early chapters present a concentrated summary of the structure of the Russian language. Former students of Russian may be surprised by the early coverage in chapters 4 and 5 of two relatively difficult subjects, namely verb aspects and participles. However, the frequency of occurrence and the importance of these forms certainly necessitate their early recognition and understanding by the beginning reader.

The text omits discussion of Russian script and traditional writing exercises. Also missing are the English-to-Russian exercises and the question-and-answer approach. Instead, each chapter reviews one grammatical unit such as nouns, verbs, pronouns, etc., with later chapters providing details and special cases. Several helpful tables are provided which include: "High-frequency word list," "List of troublesome words," and a detailed "Master verb table."

From the beginning, very extensive use is made of cognates from English, German, and French which are so common in Russian scientific literature. This minimizes dictionary usage, while simultaneously building both vocabulary and confidence in the reader. The translation exercises are drawn, in their original form, from Russian books and papers. This is particularly valuable in providing familiarity with current language structure and usage. A brief listing and discussion of common Russian scientific slang would have been a helpful addition to the text.

The book measures 5½ by 7 inches, with a soft cover and spiral plastic binding, and comprises 225 pages. It is not an easy course, but it is thorough. However, reading in any foreign language is a skill requiring extensive practice. Once acquired, it must be continuously maintained. The need is critical today among Western scientists for a reading knowledge of scientific Russian. Professor Condoyannis' text offers an effective and economical means of filling this need. Two companion volumes by this author, *Scientific French* and *Scientific German*, were reviewed in THIS JOURNAL (November 1957 issue, p. 267).

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Potato Processing, by William F. Talburt and Ora Smith; 475 pp. The AVI Publishing Co., Inc., Westport, Conn. Price, $9.50; foreign, $10.50. Reviewed by P. E. RAMSTAD, General Mills, Inc., Minneapolis, Minn.

Here is a book that should be of interest to cereal chemists for a number of reasons. It deals with a noncereal crop which on a dry-matter basis is largely starch. Like cereal grains, the per-capita consumption of potatoes in the United States is less than formerly, and less than that in many other countries. In this book comparisons are made of the nutritive values of potatoes and cereal products. The use of potato flour in baked products is discussed.

In addition to the two authors, sixteen other specialists collaborated in the preparation of this volume. As a consequence, some material is repeated several times under different headings and some chapters are more carefully documented than others. The book has value for both the research scientist and the practical processing-plant operator.

On the whole, the book is a worthwhile addition to the literature on food processing. It provides excellent, up-to-date, illustrated descriptions of various potato products and the technological considerations important in their manufacture. These include potato chips, frozen products, dehydrated granules and diced potatoes, flakes, starch and flour, canned and pre-peeled potatoes, and miscellaneous products. This is preceded by discussions on chemical composition, physiology, diseases, and nutritive value of potatoes.

Cereal chemists may have criticism to offer on two of the chapters. It does appear that the author of the chapter on nutritive value made a sweeping conclusion when he described potatoes as superior to "inferior bread" without completely describing the latter or the total diet used as the basis for comparison. The chapter on potato flour seems to lack certain information that would be most useful to one desiring to do an intelligent job of buying and using potato flour in baked products where the author claims it has demonstrated value.

AACC

LOCAL SECTIONS

Lone Star Section and **Pioneer Section** members attended an enthusiastic meeting and report on the new Southwest wheat crop at the Holliday Inn Hotel in Dallas, July 17 and 18. Social entertainment for members and their families Friday evening was followed on Saturday, July 18, by a panel report of the new crop from all areas of the Southwest. Jim Doty of Doty Laboratories gave a comprehensive report. General observations were that the new crop flour requires slightly more mixing and has better mixing tolerance; loaf volume and other bread characteristics are excellent in most areas; ash analysis is slightly higher than in flour of the old crop, but it does not affect the baking quality adversely.

John Shellenberger spoke to the group on his recent trip to Europe and discussed affairs and problems of the International Association of Cereal Chemists. He also told about his visit to the Soviet Union, where he visited the milling and cereal industries. The group was pleased to have our National Executive Secretary, Ray Tarleton, meet with us. Ray discussed affairs and plans of the National Association.

George Schiller, chairman of the Lone Star Section, announced plans for a joint meeting of the Texhoma District No. 7 Operative Millers and Lone Star chemists at Texhoma Lodge, Oklahoma, September 18-19.

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Kansas City Section met on June 17 at Hotel President, Kansas City, Mo., for a panel meeting on bakery service problems. Those taking part were Jim Bennett and Larry Marnett of C. J. Patterson Co.; Jim Doty of Doty Laboratories; Bill Green, Continental Baking Co.; Glenn Hargrave, Paniplus Co. Panel members gave their ideas on what a bakery service man should do when he makes a call. All felt that the work should be done through the production man in the plant, who must come up with the answers. A question-and-answer period followed the panel discussion.

It was voted to extend an invitation to the Pioneer Section to hold their final crop reporting meeting in Kansas City.

The section was honored by the presence of John A. Johnson, president-elect of the Association.

A letter was read from Mr. Fay Buck, who is now in Haiti.

The August meeting was held on Saturday, the 15th, with an informal dinner and committee meetings the evening before. Saturday's program began with a talk on "Environmental factors in wheat production" by Armand Pauli, agronomist at Kansas State University.

Taking part in a panel on the 1959 wheat crop were Howard C. Becker, Lawrence Iliff, John W. Giertz, George W. Schiller, Charles T. Newell, Marvin L. Lawrenson, and C. W. Pence.

Speaker at the noon luncheon was Dwane Foote, secretary of the Nebraska Wheat Improvement Association; his subject was "Varieties of the 1959 wheat crop and future varieties."

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Pioneer Section held a quarterly meeting Friday and Saturday, July 31 and August 1, at the Lassen Hotel, Wichita, Kansas. Informal entertainment Friday evening featured color slides made by visitors to the national meeting in Washington, D. C., and a film by Wayne V. Parker entitled "Winnipeg and the Churchill Tour"; this shows, among other things, the farming scene in Canada and wheat-handling operations at Churchill on upper Hudson Bay.

After a business session and reports from committee chairmen on Saturday morning, Charles W. Pence, president of the Kansas Wheat Improvement Association, discussed "Variety, environment, disease, and insect factors in the 1959 crop." James M. Doty of Doty Laboratories spoke on "The way the 1959 crop looks to the baker," and Gilbert H. Bruner of North Dakota Agricultural Experiment Station, Fargo, talked to the group on "The specific volume of flour and wheat meal."

Officers for 1959-60 are: Claude Neill, chairman; Wayne V. Parker, vice-chairman; Eugene V. Holm, secretary.

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Pacific Northwest Section's Newsletter for July has these comments about the annual meeting held in June.

"We were favored with the presence of our National President, Del B. Pratt, who presented a very informative and worthwhile paper to get our program off to a good start. He also contributed very strongly to the West Side's bowling score which enabled them to come from behind and win the coveted Bowling Plaque by a very narrow margin. The East Side names on the plaque were getting a little monotonous anyhow, so most were happy to see the underdog come up for a little glory.

"Unfortunately, Del had to return to Minneapolis early the next and final day of our meeting, and has sent his apologies to the Section for having been unable to remain with us and present his scheduled comments on Association affairs.

"Bozeman, Montana, will be our host for next year's annual meeting, and Cliff Watson states that they are already considering some of the arrangement hurdles and how to clear them.

"Montana had a strong representation at our meeting this year, and it is a pleasure to inform you that our new Secretary-Treasurer is Don Pitts of Montana Flour Mills at Great Falls. Joe Shogan was named as your new Vice Chairman." Doyle C. Udy is chairman.

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LOCAL SECTION OFFICERS

Northwest Section, No. 1

Chairman: ROBERT J. PICKENPACK, General Mills, Inc., 9200 Wayzata Blvd., Minneapolis, Minn.

Vice President: EDWARD LIEBE, Grain Branch, USDA, 116 Federal Office Bldg., Minneapolis, Minn.

Secretary: RAY ANDERSON, Central Research Labs, General Mills, Inc., 2010 E. Hennepin, Minneapolis 13, Minnesota.

Treasurer: SHELDON GREENBERG, Research Laboratory, The Pillsbury Company, 311 2nd St. S.E., Minneapolis 14, Minn.

Meeting place: Minneapolis, Minn.

Meeting date: Last Friday of each month.

Pioneer Section, No. 2

Chairman: WAYNE V. PARKER, 630 So. Lorraine Avenue, Wichita 16, Kansas.

Vice-Chairman: EUGENE V. HOLM, 914 Board of Trade Bldg., Kansas City 5, Mo.

Secretary-Treasurer: ROBERT HOECKER, Consolidated Flour Mills, Box 910, Wichita, Kansas.

Meeting place: Wichita, Kansas, and Enid, Oklahoma.
Meeting date: Regularly in April, August, and December; Tri-State at Manhattan, Kansas, in October, and joint meeting with Kansas City Section in February.

Kansas City Section, No. 3

Chairman: LESTER FISCHER, Rodney Milling Co., 1550 W. 29th St., Kansas City, Mo.
Vice-Chairman: ROBERT T. CRAIG, Bay State Milling Co., Leavenworth, Kansas.
Secretary-Treasurer: EDWARD CHAPMAN, Doty Laboratories, 1435 Clay St., No. Kansas City, Missouri.
Meeting place: Kansas City, Mo.
Meeting date: Second Wednesday of each month.

Nebraska Section, No. 4

Chairman: JOSEPH V. NIGRO, Nebraska Consolidated Mills, Omaha, Nebraska.
Vice-Chairman: REX RUCKSDASHEL, Lexington Mill & Elevator Co., Lexington, Nebraska.
Secretary-Treasurer: EDGAR MEYERS, Nebraska Consolidated Mills Co., Fremont, Nebraska.
Meeting place: Not regular.
Meeting date: Third Saturday of each month.

Central States Section, No. 5

Chairman: A. R. HANDLEMAN, Monsanto Chemical Co., 800 No. Lindbergh Blvd., St. Louis 66, Mo.
Vice-Chairman: TOM SHAUGHNESSY, Russell-Miller Milling Co., Alton, Ill.
Secretary-Treasurer: JOHN WATSON, Anheuser-Busch, Inc., 721 Pestalozzi St., St. Louis, Mo.
Meeting place: Not regular.
Meeting date: Not regular.

Niagara Frontier Section, No. 6

Chairman: JACK W. MONIER, General Mills, Inc., 54 So. Michigan Avenue, Buffalo 3, New York.
Vice-Chairman: ROBERT VAN BUREK, Wallace & Tiernan, Inc., 975 Fuhrmann Blvd., Buffalo 3, New York.
Secretary: FRANK WAGNER, Feedstuffs Laboratory, 70 Chippewa St., Buffalo, N. Y.
Treasurer: CHARLES BRONOLD, Geo. Urban Milling Co., 200 Urban Blvd., Buffalo, N. Y.
Meeting place: Buffalo, N. Y.
Meeting date: Second Monday of each month.

Pacific Northwest Section, No. 7

Chairman: DOYLE C. UDY, Western Wheat Quality Laboratory, Agricultural Experiment Station, Pullman, Washington.
Vice-Chairman: A. J. SHOGAN, Centennial Mills, Inc., P.O. Box 2159, Spokane, Wash.
Secretary-Treasurer: DONALD PITTS, Montana Flour Mills, Great Falls, Montana.
Meeting place: Different location each year.
Meeting date: June, 1960.

Midwest Section, No. 8

Chairman: EDWARD FEIGON, Kitchen Art Foods, Inc., 2320 No. Damen Avenue, Chicago 47, Ill.
Vice-Chairman: TOD J. STEWART, Shulze & Burch Biscuit Co., 1133 N. W. 35th St., Chicago 9, Ill.
Secretary-Treasurer: STANLEY A. WATSON, Corn Products Refining Co., Chemical Division, Box 345, Argo, Ill.
Meeting place: Chicago, Ill.
Meeting date: First Mondays, October through May.

New York Section, No. 9

Chairman: ELWOOD C. EDELMANN, The Great A & P Tea Co., National Bakery Division, 420 Lexington Avenue, New York 17, N. Y.

Vice-Chairman: WILLIAM J. SIMCOX, Distillation Products Industries, 630 Fifth Avenue, New York 20, N. Y.
Secretary-Treasurer: ROLAND A. MORCK, National Biscuit Co., Research Center, Fairlawn, New Jersey.
Meeting place: New York, N. Y.
Meeting date: Second Tuesday, October through May.

Lone Star Section, No. 10

Chairman: GEO. W. SCHILLER, The Pillsbury Company, P.O. Box 1388, Enid, Oklahoma.
Vice-Chairman: DON HATCH, Campbell-Taggart Research Corp., 3401 Haggar Drive, Dallas, Texas.
Secretary-Treasurer: E. A. VAUPEL, Food Industries, Inc., 2203 Butler St., Dallas 35, Texas.
Meeting place: Not regular.
Meeting date: Spring, summer, and fall.

Toronto Section, No. 11

Chairman: GEORGE W. SMILEY, c/o Maple Leaf Milling Co., 12 Monarch Road, Toronto, Ontario, Canada.
Vice-Chairman: A. E. CHEADLE, Canada Packers Ltd., 2200 St. Clair Ave. W., Toronto, Ontario.
Secretary: TED ROBERTS, Toronto Elevators, Box 370, Sta. A, Toronto, Ontario.
Treasurer: PAUL R. TEMPLIN, 70 Wicksteed Ave., Toronto 17, Ontario.
Meeting place: Toronto, Ontario.
Meeting date: Third Friday of month: September to April.

Cincinnati Section, No. 12

Chairman: LEWIS W. BAKER, The Mid-West Laboratories Co., Inc., T-V Sta., Box 5085, Columbus 12, Ohio.
Vice-Chairman: WM. T. YAMAZAKI, Soft Wheat Quality Laboratory, Ohio Experiment Station, Wooster, Ohio.
Secretary-Treasurer: LESTER BRENNEIS, Harris Milling Co., 400 South Elm Street, Owosso, Michigan.
Meeting place: Not regular.
Meeting date: No fixed date. Usually meetings are held in September, January, May.

Canadian Prairie Section, No. 14

Chairman: L. JOHNSON, Maple Leaf-Purity Mills, Winnipeg, Manitoba.
Vice-Chairman: W. BUSHUK, Grain Research Laboratory, 190 Grain Exchange Bldg., Winnipeg 2, Manitoba.
Secretary-Treasurer: L. H. RENNIE, Soo Line Flour Mills, 7 Higgins Ave., Winnipeg 2, Manitoba, Canada.
Meeting place: Grain Exchange Bldg., Winnipeg.
Meeting date: Third Tuesday of each month, October to April.

Northern California Section, No. 15

Chairman: WESLEY M. NOBLE, 1927 Bayview Ave., Belmont, Calif.
Vice-Chairman: DANIEL G. MCPHERSON, General Mills, Inc., 116 New Montgomery St., San Francisco, Calif.
Secretary: WM. J. STEPHENS, 71 Aquavista Way, San Francisco 27, Calif.
Treasurer: DELMAR E. LOEWE, 6 Trina Ct., Walnut Creek, Calif.
Meeting place: Not regular.
Meeting date: First or second Wednesday of month, October through June.

Southern California Section, No. 16

Chairman: JOSEPH H. TOPPS, California Milling Corp., 1861 East 55th St., Los Angeles 58, Calif.
Vice-Chairman: ED BROOKS, Carnation Research Labs., 8015 Van Nuys Blvd., Van Nuys, Calif.
Secretary: ADA MARIE CAMPBELL, 1271 Devon Ave., Los Angeles 24, Calif.
Treasurer: JACK LAX, Joe Lowe Corp., 2744 East 11th St., Los Angeles, Calif.

Chesapeake Section, No. 17

Chairman: J. E. MCGINNIS, Standard Brands, Inc., 273 Lock Haven Road, Baltimore 18, Maryland.
Vice-Chairman: EDITH A. CHRISTENSEN, Grain Division, AMS, USDA, Agricultural Research Center, Beltsville, Maryland.
Secretary: WALTER GREENAWAY, ARS, Field Crops Research Branch, Agricultural Research Center, Beltsville, Maryland.
Treasurer: CHRIS C. HANSEN, American Stores, Bakery, 59th & Upland Way, Philadelphia 31, Pa.
Meeting place: Not regular.
Meeting date: Fourth Thursday of September, November, January, April.

the President's Corner

news of the association

In another portion of this issue of CEREAL SCIENCE TODAY is a complete roster of the various standing and technical committees of your Association. Our immediate past president, Mr. Clinton L. Brooke, Dr. John A. Johnson, former chairman of the Technical Policy Committee, Kenton L. Harris, new chairman of the Technical Policy Committee, and your president have all had a part in formalizing these appointments. It is our hope that this roster is complete and accurate, although I am certain that as always there will have been some omissions which will have to be corrected. Formal recognition and appointment of some 350 committee members is a difficult chore at best, and even as this is being written some final corrections have had to be made.

Summertime is usually a lull in the activities of our Association, what with vacations and the press of new wheat harvest, and this year represents only one exception. In early June I traveled to the West Coast and visited with members of the Rocky Mountain Chemists' Club in Ogden, along with a number of personal visits in the San Francisco area, thence up to Seattle for the annual little AACC meeting presented by the Pacific Northwest Section.

In San Francisco I spent a very enjoyable evening with Cecil Pinney and Bill Ziemke and their wives. In his travels Cec has become an expert in exotic foods and in the manipulation of chop sticks. Ask him for a lesson. Also visited with Bill Prouty who was up to his ears getting the new Langendorf cake plant into production.

In Seattle the weather was ideal and the Pacific NW Section had a full schedule arranged for everyone. On Sunday I particularly enjoyed a wiener roast in the Sundberg back yard with their family and the Doyle Udy family. On Monday the formal program was restricted to the morning session, at which your president presented a technical paper. Other portions of the program were handled by representatives of AMF and Schlumberger, who gave interesting talks on the Amflo dough process and the nuclear magnetic resonance instrument and its applications. — Monday afternoon a lovely boat ride across the sound for a salmon barbecue— a new experience, but food out of this world. Opposing pitchers in the soft ball game were harassed horribly by the umpire, Mark Barmore. Winning pitcher, Pratt, losing pitcher Gust Zacher who was demoralized trying to field a bunt.

Monday nite, bowling tournament. — Won this year by the Western slope team which apparently has suffered a long dry spell in terms of wins. I had to forego the Tuesday portion of the program and luncheon and banquet due to a change in schedule which demanded immediate return to Minneapolis. Pacific NW Section does a fine job of putting on a program, and it was a pleasure to meet many new people and to renew many old acquaintances.

The schedule for this fall and winter and visits to the various sections is shaping up nicely, and plans now are already completed for visits to nine other sections.

More next time.

D. B. PRATT, JR.

ASSOCIATION COMMITTEES, 1959-1960

Advertising
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Majel M. MacMasters, *Chairman;* K. L. Harris, O'Dean Kurtz, Max Milner, R. J. Tarleton, J. A. Johnson

Revision of Constitution (inactive)
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PREVIEWS from CEREAL CHEMISTRY

Table of Contents from Vol. 36, No. 5, September.

FEED technology

1959 FEED PRODUCTION SCHOOL

The 10th Annual Feed Production School will be h at the Continental Hotel in Kansas City, Missouri September 23-25. The central theme of the program w be pelleting because of great industry interest, and l of factual data on this operation.

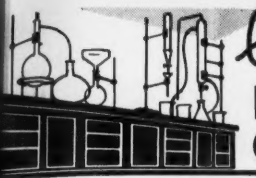
The school has traditionally been organized to inte production personnel. This year, however, a number presentations will also attract industry members c cerned with nutrition, formulation and quality control few of these have been listed briefly below.

1. "A Research Engineer Looks at Roughage Pelleti and Wafering," by J. B. Dobie, Dept. of Agr Eng'g., Univ. of Calif., Davis
2. "Pelleting Problem Ingredients," by C. N. Hultber California Pellet Mill Co., Crawfordsville, Ind.
3. "Feed Pelleting Operations and Their Effects o Micro-Ingredients," by R. C. Wornick, Agricultur Research Dept., Chas. Pfizer & Co., Inc., Ter Haute, Ind.
4. "More Efficient Crumblizing," by R. Bartikoski Nutrena Mills, Minneapolis, Minn.
5. "Pelleting Production Is Affected by Formulation by Dr. Chas. Lewis, Kent Feeds, Muscatine, Ia.
6. "Specialized Session on Quality Control," Chmn: Dr. E. H. Spitzer, Murphy Products, Inc., Burlington, Wis.
7. "Specialized Session on Premixing," Chmn: W. L Brickson, Specifide, Inc., Indianapolis, Ind.

Over 50% of all manufactured feeds undergo som type of pelleting operation. This year's attendance i therefore expected to exceed last year's figure of over 60 participants. Of the two dozen technical presentation several will provide brand new data from current industr research projects. Many months of preparation have gon into this program, by a battery of experts. Indeed, th Feed Production School is one of the major annual r search events in the feed industry.

For personnel from smaller feed mills, a concentrate one-day session is also offered on Saturday, Septemb 26. Further information regarding the "Feed Productio School" and "Small Mill Short Course" may be o tained from Feed Production School, Inc., 20 West 9 Street Building, Kansas City 5, Mo.

ROBERT C. WORNIC



laboratory HELPS and GADGETS

Notes on the Maltose Test

We have had occasion to run large numbers of maltose tests on a semiproduction-line basis. Over a period of time, we have worked out some refinements of the test that have reduced our standard deviation between replicate tests to less than 0.5% of the maltose found. None of these refinements, taken individually, has any great effect; however, their cumulative effect is to bring about greater uniformity of results.

The test, while based on sound scientific principles, is also empirical in that any deviation from the method as given will bring about different results. From this it follows that good results will be obtained only by meticulous attention to detail, and by running all tests in *exactly* the same way.

In addition to having all solutions properly standardized and a water bath capable of maintaining its temperature within the prescribed limits (which are only mentioned in passing), there are five points that deserve particular attention:

1) Agitation;
2) Immersion of digestion flasks in 30° bath;
3) Timing a) during agitation, b) in 30° bath, and c) in boiling water bath;
4) Capacity of boiling water bath;
5) Transfer of solution from test tube to titration flask.

Agitation. The motion which seems to give the best and quickest dispersal of the flour in the buffer solution is a rapid rotary wrist action so that the flask oscillates through an arc of about 100° in a plane perpendicular to the forearm.

Immersion of digestion flasks. It is important that the digestion flasks be as completely immersed in the digestion bath as possible. A good way to accomplish this is to fasten, along the long edges of the water bath, a couple of $\frac{3}{4}$ by $1\frac{1}{2}$-in. wood strips with tool clips screwed to their edges. The overflow from the bath is closed off and the bath filled with enough water to bring the surface to not less than $\frac{1}{4}$ in. from the top of the bath during digestion of the samples. The flasks, when held down by the tool clips, will be completely immersed except for their necks.

Timing. (a) During agitation: Determine the maximum time necessary to obtain complete dispersal of the flour-and-buffer mixture. At the start of each test agitate each test for this time, even though some of them may be dispersed in a shorter time. When the tests are agitated at the 15-minute intervals, as prescribed in the method, all flasks should receive exactly the same amount and kind of agitation.

(b) In 30° bath: Start the tests in each set one at a time. Find out how long it takes to start a test and use that interval between all tests. It is well to allow a little leeway here for such minor crises as a dropped stopper or overfilling the buffer graduate. Time the digestion from the time agitation is started.

At the end of the 1-hour digestion period, remove the tests, one at a time, in the same order and at the same time intervals as when they were started, so that each test has been digested exactly 1 hour. This may seem complicated and time-consuming. However, not much time will be lost, as when a test is removed from the bath there should be plenty of time to add sulfuric acid and tungstate solutions and start filtration before the next test is removed. By the time the last test has started through the filter, enough filtrate will have accumulated from the first one so that the taking of aliquots can start at once.

(c) In boiling-water bath: In the same way as at the start of the test, place the test tubes in the boiling water one at a time and at definite time intervals (possibly every 5 or 10 seconds); and when the boiling period is over, transfer them to the cooling bath in the same order and at the same time intervals, so that each test will be in the bath exactly 20 minutes.

Capacity of boiling-water bath. The method specifies a "vigorously boiling water bath." It might have been added that the bath should have a great enough capacity that it will continue to boil even when the cold test tubes are immersed in it. A 4-liter beaker full nearly to the top has been found satisfactory when eight test tubes are to be boiled at one time. A float must be used in the bath to hold the test tubes upright and keep them in order. A circular piece of wood, with holes bored through it to receive the test tubes, works well here.

Transfer of solution from test tube to titration flask. When the solution is poured from the test tube to the titration flask a drop may run down the outside of the test tube and be lost, causing erroneous results. When pouring, always let the solution flow down a stirring rod that is in contact with the edge of the test tube. The stirring rod should then be rinsed with the acetic acid-salt solution rinsings from the test tube. A pouring lip drawn into the mouth of the test tube will also help at this point.

Although they are not "musts," there are a couple of other points that may be helpful. The method suggests the use of a 10-ml. microburet for the titration with $0.1N$ hypo. It has been found to be much more convenient, and better checks are obtained when the $0.1N$ hypo is diluted 1:4 to make $0.5N$ and the titration is carried out using a regular 50-ml. buret. It requires much less than a drop of $0.1N$ hypo to develop the endpoint, and one can never be sure when using fractional drops that one has not overtitrated. One drop of $0.5N$ hypo is just about right to produce an endpoint. Another advantage of the 50-ml. buret is that it is so much simpler to fill. In order to save recalculation back to terms of $0.1N$ hypo and to facilitate interpolation, it will be found helpful to graph the figures in table 92.2d, *Cereal Laboratory Methods*, 6th ed., in terms of $0.5N$ hypo, so that mg. maltose may be read directly from the graph.

Ross Cory

Observations

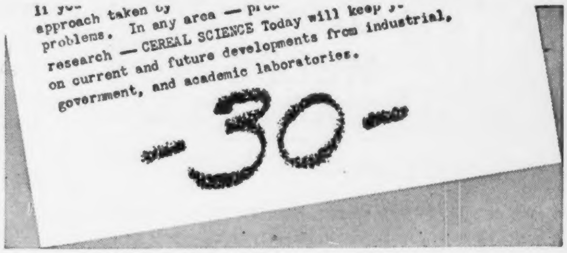
Trying to write for scientific publication is about like trying to play golf. It is necessary to keep your mind on so many things that you forget the whole purpose of your effort. Trying to remember to keep your eye on the ball, your head still, a slow back swing, a firm grip with the left hand, shifting your weight, and a smooth follow-through is all just fine if you think of those things and still remember the prime object, which is to hit the ball straight and far. Writing for publication requires that you remember sentence construction, style, tense, brief and concise form, proper scientific abbreviations, and spelling. All of these are fine and dandy too provided you can keep in mind at all times that your prime object is to convey to your reader a clear-cut picture. Needless to say, I have been preparing some material for publication. I have written, scratched out, deleted, modified, and re-written until I am sure the result is inferior to the original. Perhaps this explains why my golf game is getting worse each year. This paragraph is written exclusively in defense of my golf game. It could be called a defensive observation as compared with offensive. Heaven only knows I am offensive enough.

September is the month we quit thinking of the heat and begin thinking of the cold. Storm windows instead of screens, furnace instead of air conditioners, heavy underwear instead of shorts, blondes instead of brunettes, and Doty Laboratories instead of more help.

We are here to serve you. So if you don't have time to set up the Sandstedt Damaged Starch procedure, just send your samples to us.

Yours very truly,

Jim Doty



BIG "D"

Forming new friendships is one of the many rewards of AACC membership. It is difficult to name a group of professionals who exhibit more real hospitality than do the cereal chemists.

This good neighbor attitude was in evidence on my recent trip south. Mrs. Tarleton accompanied me on a two-week business and vacation swing to Dallas, Houston, Galveston, and St. Louis. Immediately on arrival in Dallas we were taken in hand by Mr. and Mrs. Glenn Findley. The Findleys seem to give the traditional Southern Hospitality a special "Texas" flavor, and they made our short stay a memorable one.

Since the visit to Dallas was to discuss the 1961 convention with the Lone Star Section, I had the opportunity of spending some time with a number of active AACC members and their wives, including the Vaupels, the Metcalfs, the Rolfes, and the Hatches.

Chairing the section's technical program on Saturday morning was George Schiller of Enid, Oklahoma. Guest speakers included John Shellenberger of Kansas State University and Jim Doty of Doty Laboratories. Jim tells me that he and Mrs. Doty will take a fall trip to Europe to visit their son in Germany and look at some of the bakeries and mills on the continent. Also had a brief chat with Charley Newell, Claude Neill, and Layton Perry during the Friday evening social hour.

ON TO ST. LOUIS

After a pleasant week's vacation in Houston and Galveston visiting relatives and getting in on the edge hurricane Debra, we arrived at final destination, St. Louis.

Here again the purpose of the vi was to meet with some of the loc section people and discuss the 19 meeting. The first evening I had enjoyable dinner meeting at the Cha Hotel with Dick Kohler, John Wa son, Avrom Handleman, To Shaughnessy, and Jim Barnett. W looked over the new facilities of th Chase and talked in general tern about the convention.

On the following day I had th pleasure of meeting with Richa Haynes and Charles Grisham fo lunch at Monsanto's magnificent ne "campus." Both men are with the In organic Division, Dick being in tech nical sales and Chuck in advertising After lunch I visited the research lab oratory of the Inorganic Divisio and was given a tour of the buildin by Av Handleman. In the food labo ratory I met Tom Kichline and re newed acquaintance with Jim Con

It's difficult to view the new Mon santo headquarters without reachin for some Hollywood adjectives. I keeping with the current trend estab lished by General Motors and othe large corporations, Monsanto ha built a group of buildings in a cam pus-like setting on the outskirts of St Louis. As one would expect, plastic are put to use in about every con ceivable situation, both in decor and construction. The result is quite re markable.

My thanks to the fellows at Mon santo for a most enjoyable afternoon.

R.J.T.

"Chicago in '60"

AACC's

45th Annual Meeting • May 1-5, 1960 • Chicago

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